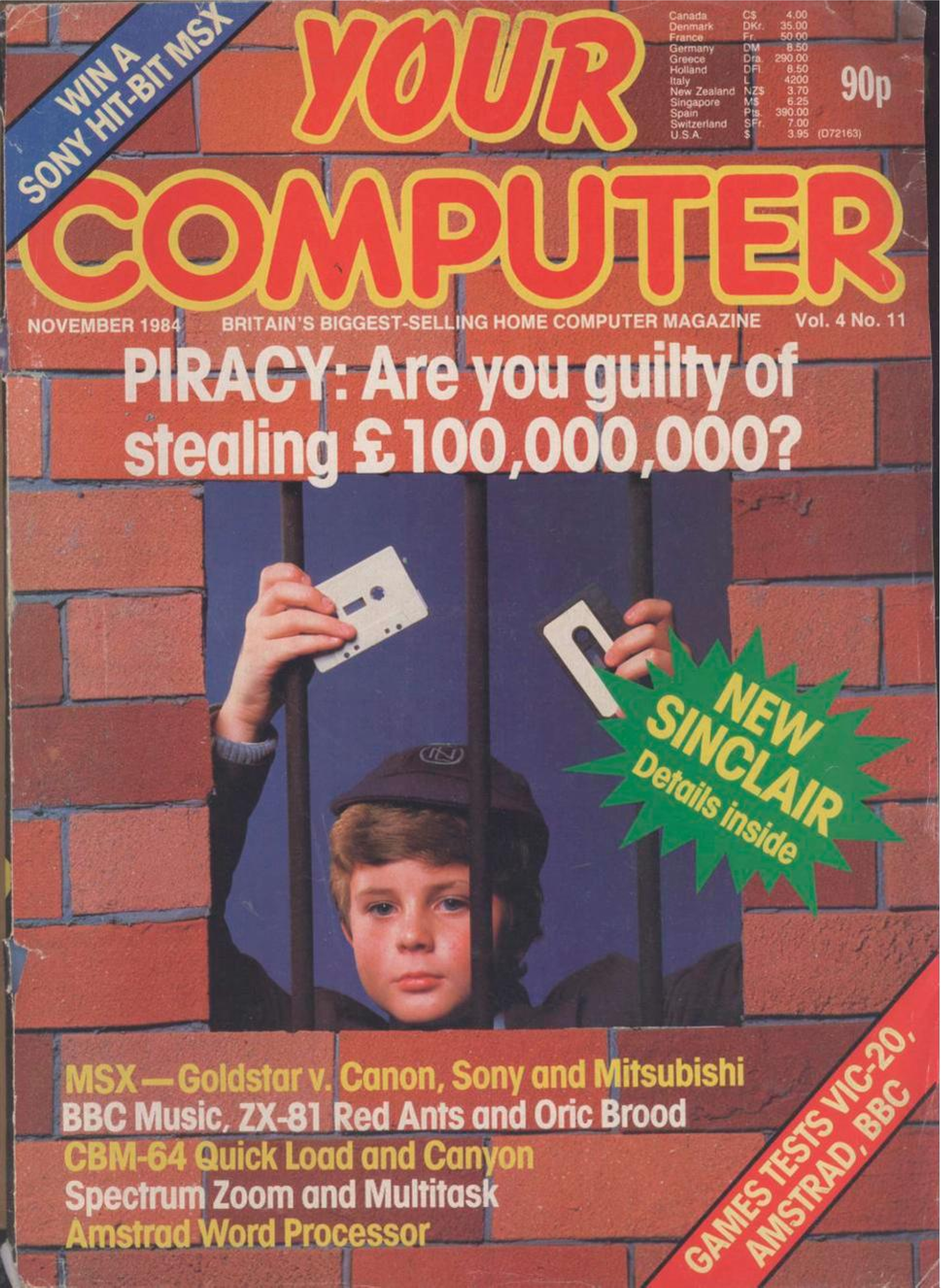


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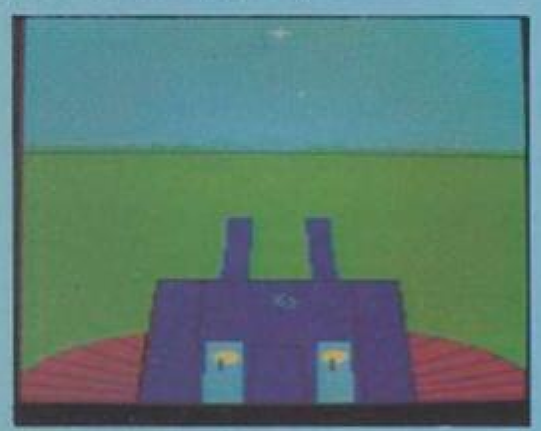
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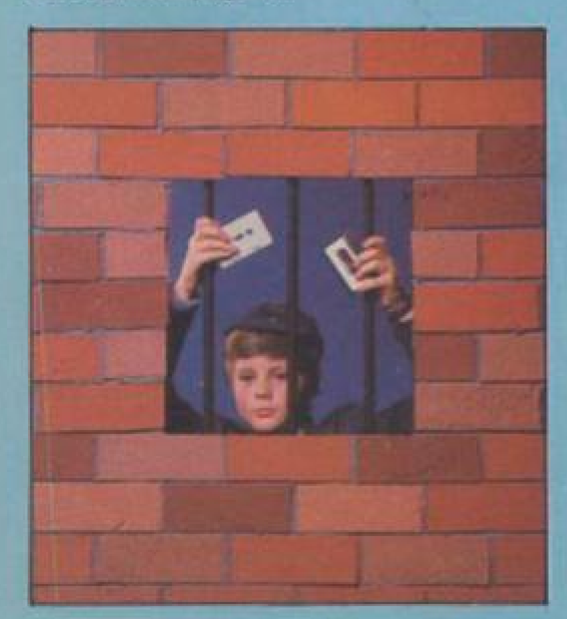
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Kokotoni Wilf

'Kokotoni Wilf' is an arcade adventure program whose undisguised intention is to steal the title of "best arcade adventure program bar non" from Jet Set Willy. Kokotoni Wilf must recover all of the pieces of the legendary Dragon Amulet (which has been scattered through time) for his master the great magician 'Ulrich'. Throughout the quest Wilf comes up against many dangers from huge Prehistoric Dinosaurs to hostile alien Robots, but the reward for recovering all of the pieces warrants the risk. The 48K program features a number of major advances over Jet Set Willy. The games designer, ELITE, stresses that each of the games 60 plus screens settings is genuinely high resolution as opposed to psuedo high-res and doesn't require a title to explain what you're looking at. The Sprite characters are of cartoon quality and exhibit their own unique personalities. Impressive claims. Jet Set Willy fans will no doubt feel both sceptical and intrigued. Now they can find out for themselves!

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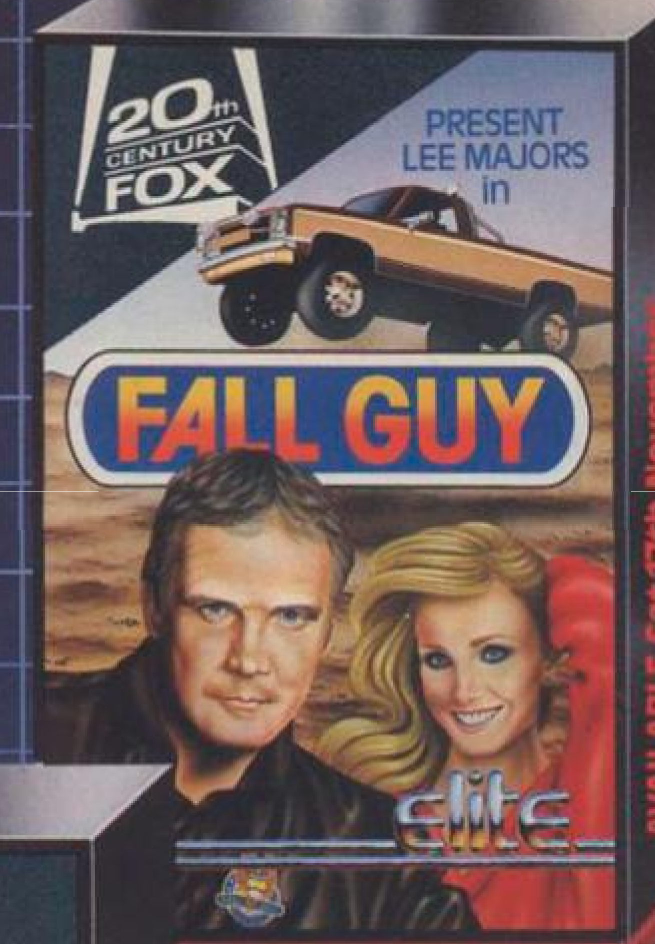
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'Colt Seavers is a top Hollywood stuntman who uses the extraordinary skills he displays before the camera when moonlighting as a modern Bounty Hunter, who apprehends and brings in Bail Bond jumpers. Colt is ably assisted by his would-be manager Howie, his beautiful stunt girl protege, Jody, and Terri the lady from the Bail Bond Company, who hires Colt when he's not before the cameras.

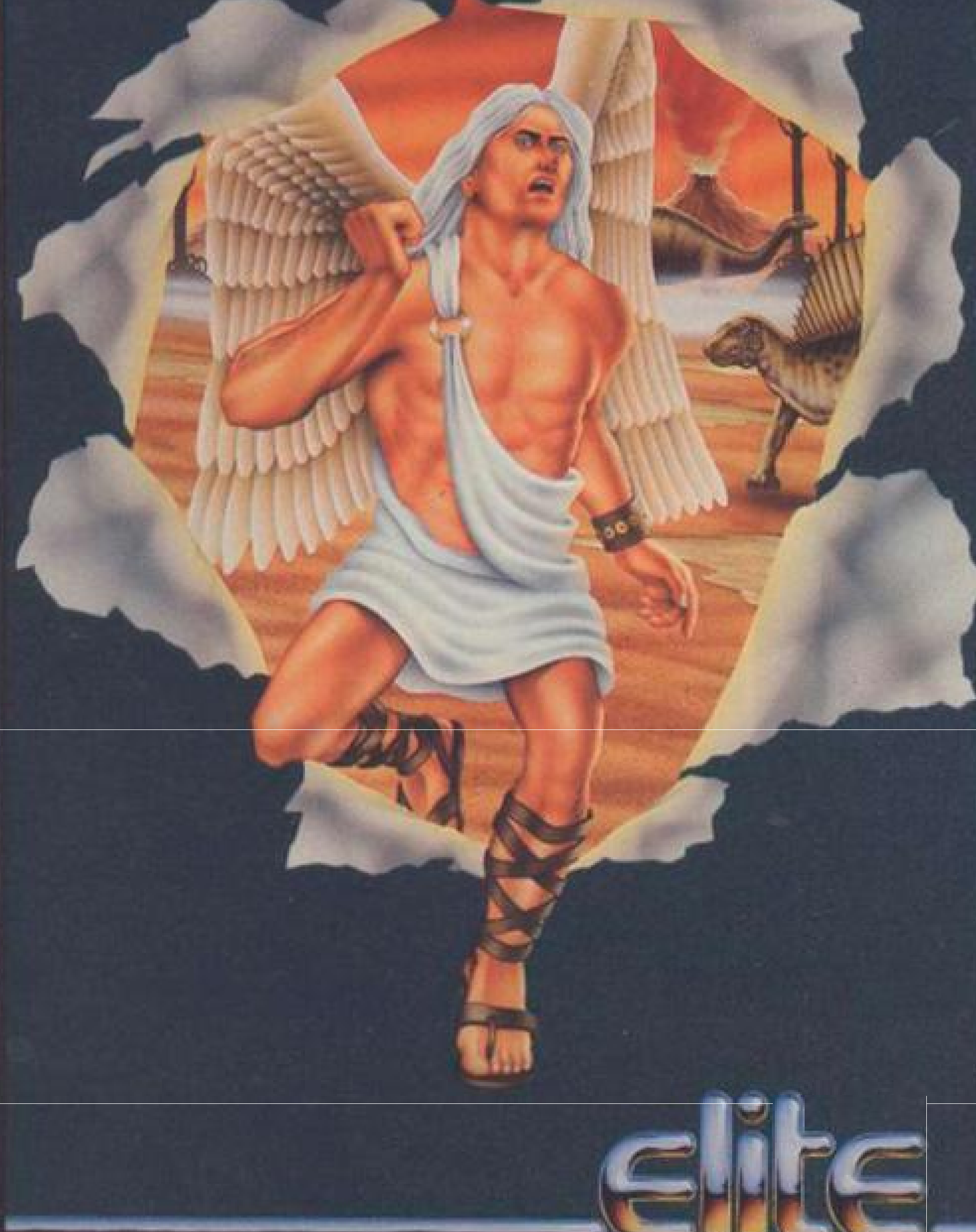
The cast of characters is:

Colt Savers	LEE MAJORS
Jody Banks	HEATHER THOMAS
Howie Munson	DOUG BARR
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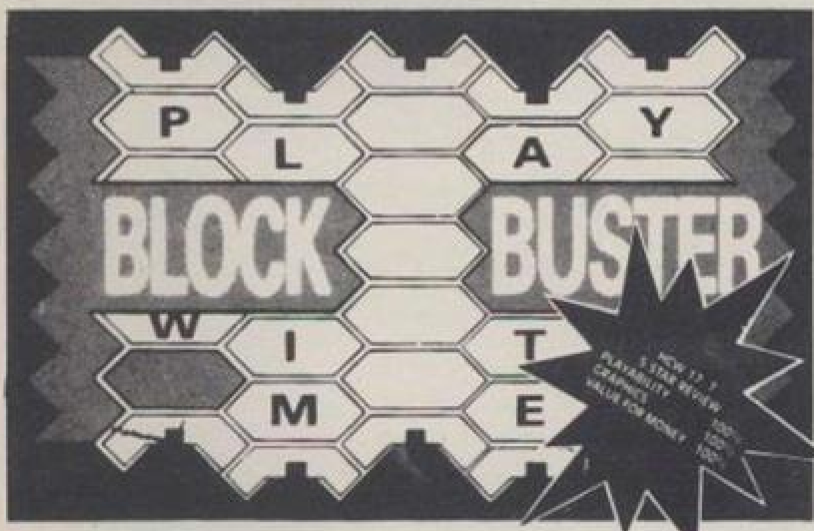
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There are quests within quests within Swords and Sorcery, for those who want to follow them. Some are given others must be found, and some are lost causes. There are many ways of opening the gate between the levels of the dungeons. Some are obscure and easy, others obvious and dangerous. The most profitable paths are both. The Ultimate goal of many will be to find the lost armour of Zob, which was un-made by its maker, and its parts scattered across the levels. What, where, how, who and why are answers to be found. All that is known is the prayer of the seekers:

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TURN US FROM WHAT SEEMS TREMENDOUS AND
THUS TO ZOBS GREAT TREASURE SEND US.

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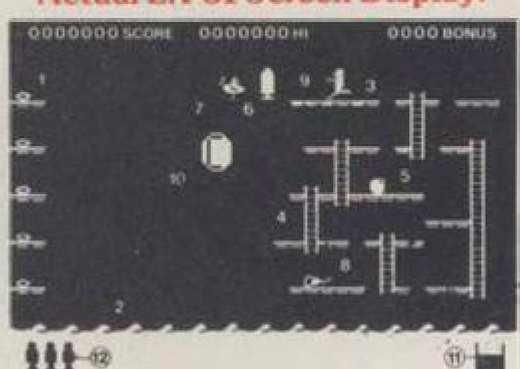
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3. Platforms
4. Ladders
5. Fuel Cans
6. Rocket
7. Vulture
8. Leg of Lamb
9. Player
10. Bubloid
11. Fuel Gauge
12. Men Remaining

Get rich quick by collecting Diamonds that are simply lying there waiting for you!

Oh . . . I forgot to mention that there are one or two problems! There is an expanse of Shark infested water between you and the Diamonds and a strange breed of Bubble that seems hell bent on getting you in it! Somehow you must cross it. . . .

You have a Rocket Pac to help you (a Vulture on higher levels) but you must rush around the platforms and ladders collecting cans of fuel (legs of lamb with the Vulture) and cursing that weird Bubble. Once you have enough fuel then it's Chocks Away!

Oh . . . but don't run out of fuel on the way – otherwise it's . . . . SPLASH!

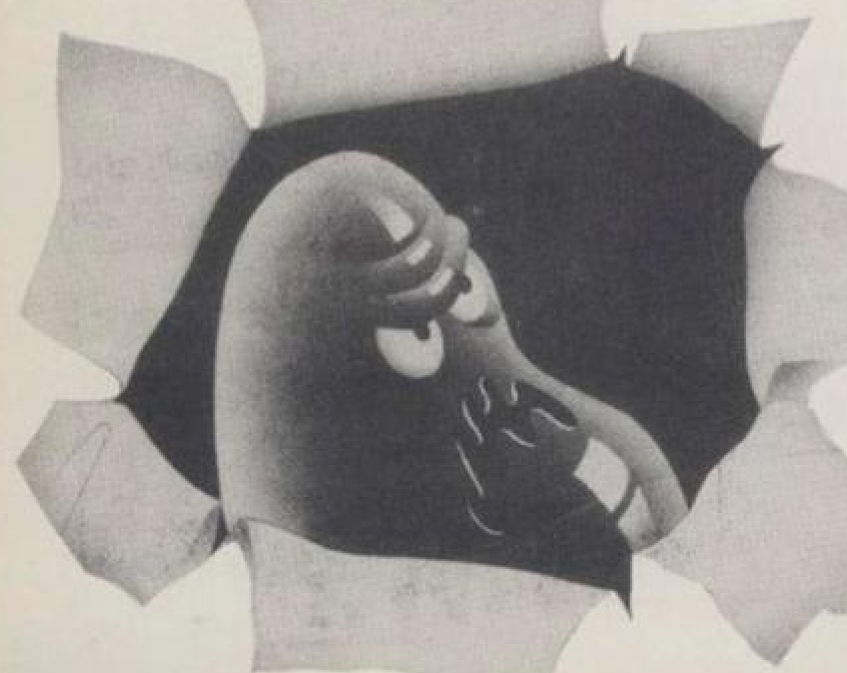
The aim is to collect all the diamonds from the far left hand side of the screen, whilst avoiding the rampant Bubloid. These emerge from the sea and are hell-bent-on returning to their watery habitat with you in tow. Sooner or later you are going to end up in the drink – The idea is to make it later!

By belting round the system of platforms and ladders, cleverly avoiding the Bubloid, you collect the fuel cans which appear in random positions, until you consider that your fuel gauge indicates sufficient in the tank. Now you can go and collect your rocket. With the rocket-pack strapped to your back you can fly across the expanse of sea to collect the diamonds . . . but don't run out of fuel or your rocket-pack will simply disappear and you will wind up in the drink!

There are six stages with six different platform layouts. On stages 1-3 the Bubloid, which floats in front of the platforms with uncanny ease, gets an ever increasing ability to home in on your position, making the task of staying alive more demanding with each stage. On stages 4-6 you once again start with the easiest Bubloid (which is a blessed relief!) but the fuel cans are replaced by legs of lamb which you must collect to feed your vulture, and once it has enough energy (or you think it has!) you must flap across the water on its back to collect the diamonds.

Extra men are awarded for every 10,000 points – but ONLY once you have collected all the diamonds and so completed each particular stage.

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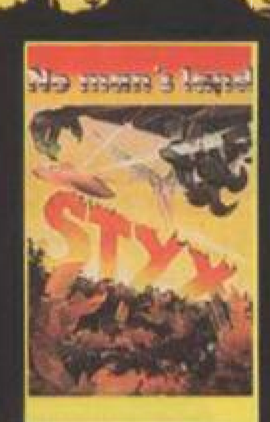
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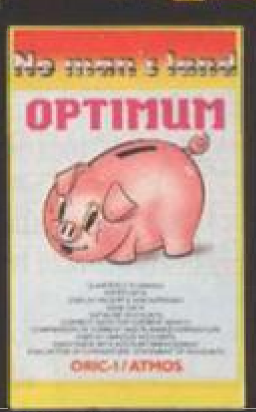
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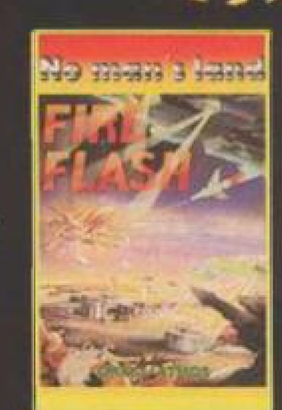
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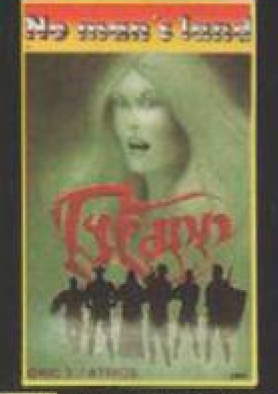
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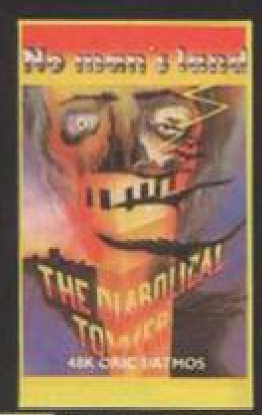
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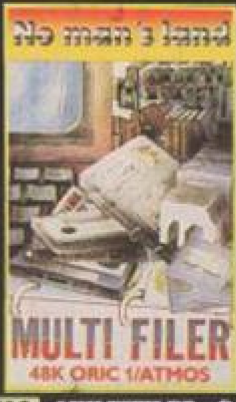
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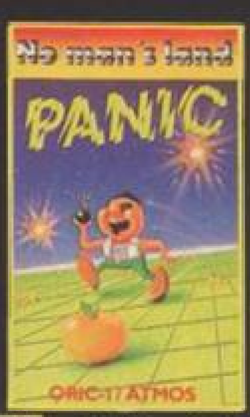
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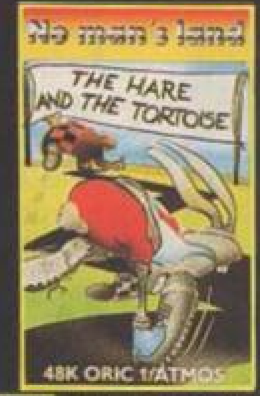
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BASIC. Most home computers speak the same language. It's called BASIC. This is a more friendly way of saying "Beginners All-Purpose Symbolic Instruction Code."

There are different kinds of BASIC and, like languages, some are a little easier to understand than others. Like, BASIC 3.5 in the *Commodore Plus/4* and *Commodore 16*.

BOOKS you can read: "Teach Yourself Computer Programming With The Commodore 64" and "Programmers Reference Guide."

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CHIP: silicon. A very complex electrical circuit miniaturised in silicon. It carries out the functions in the computer. Unlike other home computer companies, we make our own chips, so maintaining quality.

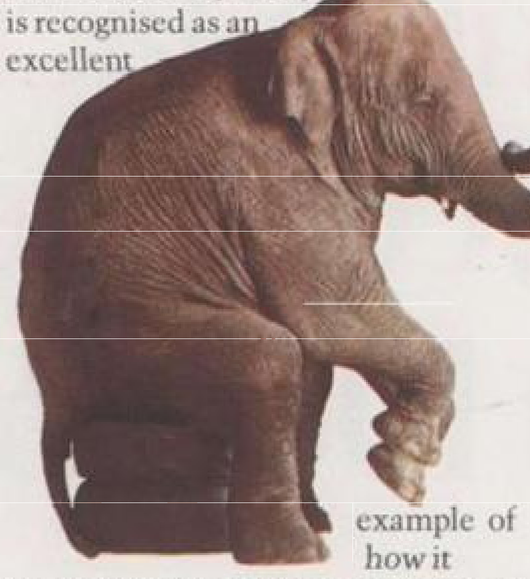
DISK drive. A program and data storage system, just like *cassettes*, but much faster. You can find and load the program you're looking for in seconds instead of minutes.

Diskettes, which can be used repeatedly for recording or re-recording programs, transfer information or instructions to and from the computer.

EDUCATION software from Commodore. We work non-stop with educationalists, improving our range of programs for the pre-school to "O" level age groups and beyond.

Computers are an invaluable educational tool – versatile, patient and able to present information in an exciting way.

Our "Get Ready to Read" series, with lovable B.J. Bear, is recognised as an excellent example of how it is possible to develop reading and writing skills in pre-school children.



ELEPHANT: well-known symbol of the *Commodore 64's* enormous 64K memory. And don't you forget it!

FOUR is for Commodore Plus/4, our very latest home computer with four, very popular built-in programs: wordprocessing, spread-sheet (financial planning), database (filing), and graphics.

It has an extensive 64K memory, with an exceptionally large 60K available for use. The Plus/4 comes equipped with the Commodore BASIC 3.5 with over 75 programming commands.

Other features include sound facilities, comprehensive graphics and 121 colours.

GORTEK and the Microchips is a unique programming course, for children of all ages, that links learning exercises with a space adventure story.

GRAPHICS.

The pictures and diagrams on a *monitor* or TV screen, either high or low resolution.

All Commodore home computers have 62 graphic symbols to create low resolution pictures and diagrams, or high resolution modes that allow you to specify each pixel (or dot) on the screen.

(There can be up to 64,000 of these).

GAMES: Commodore produce them all, and more! From shoot 'em up games, to games of adventure and complex strategy.

HELP! On both the Commodore 16 and *Plus/4* computers there is a very special feature: a HELP key. It does exactly what it says: it helps you to debug (which is the smart way of saying, "identify and correct errors") when you're programming.

It highlights errors right down to individual instructions.

HARDWARE.

The computer itself – you can touch it. Whereas software's a program you can only see or hear (on the monitor) when it's running in the computer.

INTEGRAL software is software that is actually built into the computer, as on the Commodore *Plus/4*, the very latest in home computing.

INTRODUCTION to BASIC. Just as you don't need to understand how a car works to be able to drive it, you don't have to understand how a computer works to be able to use one.

But you will definitely get more enjoyment out of it if you do have a basic knowledge of programming.

Which is why "Introduction to BASIC" has become the most popular software tutorial.

It comprises 2 cassettes and an easy-to-follow, step-by-step manual.

INPUT/output: Input is information put into the computer from either the keyboard or a storage device. Output is information from the computer to either a screen, printer or storage device.

JOYSTICK and paddles. As well as improving speed and accuracy, these make games more real by putting the control of whatever it is on the screen directly into your hands.

KILOBYTE is 1,024 bytes. So "K" stands for a unit of 1,024 or 2^{10}. A 64K byte memory unit contains 64 x 2^{10}, or 65,536 bytes of memory. And if you don't understand all that, don't worry.

All that's important is knowing you can run more complex programs through a computer with a large memory, than one with a small memory.

LANGUAGE. This is a system of coding that can be understood by a computer. It allows you to "speak" to the computer, and for the computer to "speak" to you. Most home computers speak *BASIC*, but there are also other languages available for Commodore computers that have been designed for specific uses.

For example, LOGO and PILOT in *education*.

MONITOR: this is the screen on which you can see what you've typed into the computer, and also what the computer is saying back to you. You can use an ordinary TV screen, but more preferable is a colour video monitor, like the Commodore 1701.

This is a special device that produces much higher resolution than a TV, and so offers superb reproduction and clarity.

On top of which it allows the rest of the family to stay tuned-in to their favourite TV programme while you're tuned-in to your favourite computer program.

MODEMS allow computers to connect via a telephone line to other computer systems. Commodore 64 modem owners can communicate with other owners, join systems like Prestel/Micronet and an exciting new system called Compunet, where quality software is available cheaply or even free.



MEMORY. There are two basic types of memory: ROM and RAM.

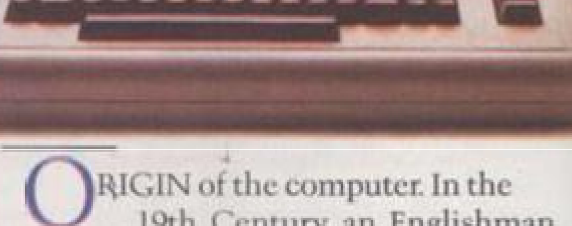
Read Only Memory (ROM) is the computer's permanent built-in memory which tells the computer what to do. It doesn't disappear when the computer's switched off.

Random Access Memory (RAM), however, is for temporary storage. It is the part of the computer's memory that's free for you to use. It can be erased and used over and over again.

HELLO! IS THAT THE COMMODORE COMPUTER ACROSS THE ROAD?

It stores both data and instructions during the execution of a computer program. These are lost when you switch the machine off – unless, of course you store them on *cassette* or *diskette*.

NUMBER ONE. In the whole wide world, Commodore is No. 1 in microcomputers, and the Commodore 64 is the No. 1 best seller.



ORIGIN of the computer. In the 19th Century an Englishman, Charles Babbage, invented the first true computer. But his "Analytical Engine," was so ahead of its time, it turned out to be impossible to build!

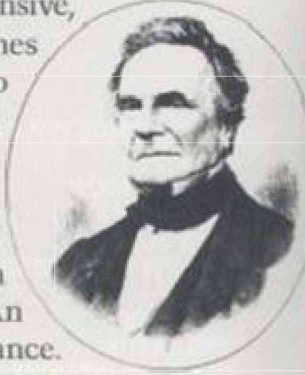
The modern computer first appeared around the time of World War II. Britain's "Colossus" was vast, consumed vast amounts of electricity, required its own air-conditioned room, was unreliable and difficult to operate.

It had its limitations.

Then came the amazing transistor... integrated circuits... and microcomputer.

The first desk top microcomputer in the world was the Commodore PET (this was a friendly name for Personal Electronic Transactor), in 1977.

In effect Commodore had taken hitherto huge, expensive, mysterious machines accessable only to eggheads, reduced the size and price, and put them into the hands of ordinary mortals in ordinary offices. An extraordinary advance.



PERIPHERALS. These are separate add-ons that will extend your computer's capabilities. Like our printers, storage devices and monitor.

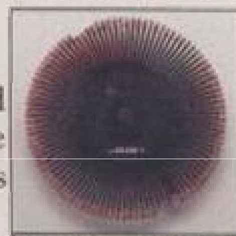
PRINTER: One of the ways a computer can "speak" to us.

It means you can produce charts, letters, documents, pictures on paper.

The Commodore range includes four printers and one printer plotter.

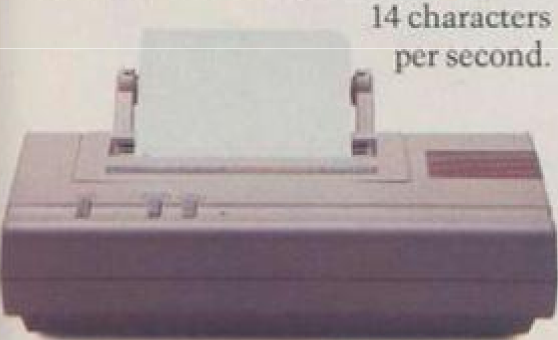
The MPS 801 dot matrix printer (so called because its characters are made up of dots) has a print speed of 50 characters per second, about five times as fast as the fastest secretary.

The MPS 802 dot matrix friction feed printer has a print speed of 60 characters per second and uses either single sheets or continuous stationery.



The DPS1101 daisy wheel printer (called that because, surprise, surprise, the print wheel looks a bit like a daisy), produces superb quality print on all letters, reports and documents (the kind of quality one desperately requires on a letter to the bank manager). There's a range of alternative type faces available on additional print wheels. Speed: 18 characters per second.

And the 1520 printer plotter (illustrated). This has 4 colours, and opens up a whole new world of graphic print-out ability. You can draw pictures, create graphic designs, plot graphs or construct bar and pie charts. Speed: 14 characters per second.

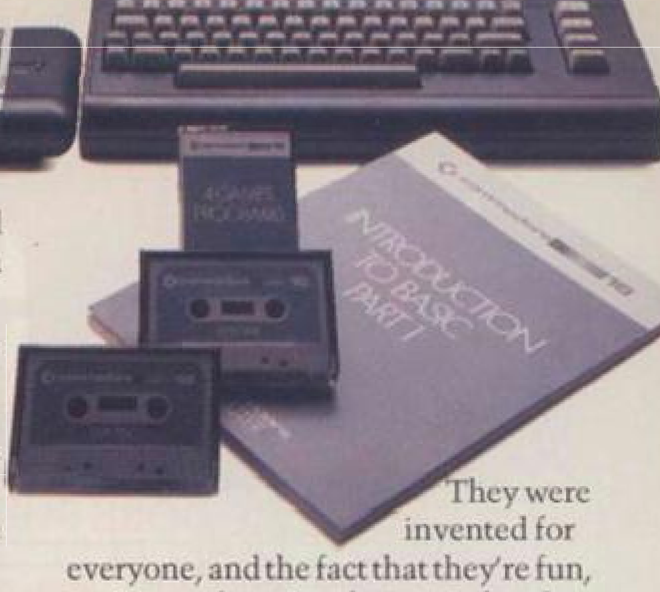


QWERTY – the 6 keys at the top left hand side of a standard typewriter. Unlike lesser machines, all Commodore computers have full-size, professional typewriter keyboards.

They have a solid, responsive feel to them. (The problem with rubber or membrane keyboards is they have a soft, spongy feel to them: you press a key, then wonder if the message got through).

RANGE. The range of Commodore software is enormous. There is something, as they say, for everyone: educational, business, home and games.

STARTER PACK. The Commodore 16 Starter Pack has been specially designed to introduce you to computing.



It contains everything you need to start home computing, complete in one box: a 16K computer, *cassette* unit, four superb software programs, and Introduction to *BASIC* Part 1.

It has a *Help* key in case you get into difficulties, and incorporates advanced *BASIC*, which has been specifically designed to simplify the programming process.

Other features include: 4 cursor keys, 2 *joystick* ports, an astonishing 121 colours, plus excellent sound and *graphics* capabilities.

TUNES. Commodore make software to help you compose your very own music.

All our home computers have great sound and music capabilities.

USER friendly. This is a program that explains itself as it goes along, or a computer that people can easily operate.

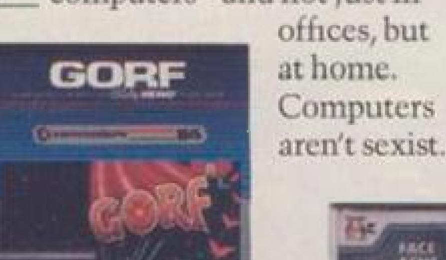
Every computer manufacturer now claims its products are "user friendly," but only Commodore really demonstrates it. For example, our *Help* key and use of Advanced *BASIC*.

VERTICAL integration is not as complicated as it sounds. All it means is that Commodore make everything to do with computers, from the silicon *chip* to the computer casing.

So we have complete control over everything, from design to manufacture.

It also means, of course, that we can design everything so you're able to get the very best out of your Commodore computer system.

WOMEN also are discovering computers – and not just in offices, but at home. Computers aren't sexist. They were invented for everyone, and the fact that they're fun, exciting, educational, practical and time-saving are benefits that apply to women just as much as to men.



XMAS. There is no better time to give or receive a Commodore present.



YIPPEE! Yes, now you know (or should do) that computers are really interesting. They're not just about space games with horrendous monsters. Nor are they horrendously complicated machines that you need a maths degree to understand.

Computers are the future, and it's important that you and, even more so, your children don't get left behind in the past.

With a Commodore computer and a *peripheral* or two (and we now know what those are, don't we?) whole new leisure and business opportunities will immediately be opened to you.

Make the choice now and (just so long as it's Commodore) we promise you will never regret it.

ZIP us a line if you'd like more even more biased information on any Commodore products.

Write or telephone: Commodore Information Centre, 1 Hunters Road, Weldon, Corby, Northampton NN17 1QX. Tel: Corby (0536) 205252.



Electrifying Action

Storm Warrior.

He needs no allies, his strength and agility will prove him worthy of the name – 'Storm Warrior'.

Storm Warrior is a 12 screen, all machine code, fast moving graphics adventure using 58K of RAM. It features 5 levels of play, full playing demo mode on the first four screens, game freeze facility and a fast loading system.

Commodore 64 Tape £7.95 Disk £9.95 (including VAT.)

The White Viper.

A great graphics adventure in the land of Demons. Coming Soon.

Commodore 64 Tape £7.95 Disk £9.95 (including VAT.)

Dead City Rescue.

The mind blowing, fast loading, 100 screen graphics adventure featuring 5 different speeds of scrolling to give an incredible depth of perspective. Mentally stimulating, strategy packed, visually stunning!

Commodore 64 Tape £7.95 Disk £9.95 (including VAT.)



Available from your favourite Software Retailer.

Dead City Rescue

The supreme test of mental muscle.

A mind blowing, fast loading, 100 screen graphics adventure featuring 5 different speeds of scrolling to give an incredible depth of perspective. Mentally stimulating, strategy packed, visually stunning.

Commodore 64
Tape £7.95 Disk £9.95
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Jet-Boot Jack is fast heading for No 1 spot in the Atari games charts.

Because he's absolutely unique.

Jet-Boot Jack is the space-age jet-powered jogger who takes you on a chase through the vaults of the Record Pressing plant, collecting his favourite music as he goes.

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Sliders and elevators provide access to new levels – but sometimes they turn nasty!

With 10 different screens and 6 skill levels Jet-Boot Jack will stretch your abilities to the limit.

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Jet-Boot Jack and our other programs are available from branches of Laskys, Greens and all good software dealers.

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Program written by Jon Williams and Mark Taylor.



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Kennedy Space Centre
& Florida Keys

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There's exciting day trips too to the Kennedy Centre, the famous DISNEY WORLD and more!

The competition closes on December 31st 1984 – call into your Spectrum dealer NOW and collect an entry form - you could win the holiday of a lifetime!

MICRO UPDATE

– Spectrum's own magazine for home and small business computers

AUTUMN ISSUE

Have you seen our MICRO UPDATE magazine yet? It's Spectrum's own computer guide, published by the experts for YOU – and the Autumn issue will be out soon.

It's packed with illustrations and descriptions of just about everything you're likely to meet in home micro hardware, add-ons and accessories. Plus there's information on current software, and hints and tips from experts about home computing.

Call in to your local Spectrum dealer and get YOUR copy – it's great!

Just Arriving

New! Commodore 16

Including Commodore 1531 Cassette Recorder



THE PERFECT INTRODUCTION TO HOME COMPUTING

Introducing the new Commodore 16 – the advanced micro that's designed with the beginner in mind.

This brand new micro features a powerful 16K RAM, a full professional keyboard, superb graphics with 121 colours, plus terrific built-in sounds.

In its 32K ROM is a new BASIC 3.5 with over 75 commands including graphics plotting and program editing. There's a unique HELP key that highlights errors when you're learning to program.

It's a tremendous new micro and the Spectrum package includes a Commodore Model 1531 Cassette Data Recorder too. See it at your local Spectrum dealer now!

SPECTRUM PRICE ONLY



Add-ons

Simon's Basic	£50.00
Intro to Basic Pt 1	£14.95
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Commodore 64
Compatible Data Recorder
ONLY



Commodore 64
Package Offer



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- 4 Cassette Games

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for up to date news, information & offers from SPECTRUM - see PRESTEL page 600181 for details

See the super new
Commodore Range
at your local Spectrum Dealer - Now!



Just Arriving New!
Commodore Plus/4

Commodore's new, advanced Plus/4 bridges the gap between home and business micros in a way that's unique - and at a price that's unbelievable!

The Plus/4 features, besides its powerful 64K of RAM memory, has a host of features to make computing easier.

For starters, there are four popular software packages built-in - Word Processing, Spreadsheet, Database and a Business Graphics program. That's all a small businesses needs - in a budget-priced micro!

Besides that, there's a HELP key that highlights errors in program lines, plus built-in graphics, advanced BASIC 3.5 with over 75 commands, separate cursor controls, a full 32K ROM and 4 programmable function keys.

SPECTRUM PRICE

£299.99

New! DPS1101 Printer



SPECTRUM PRICE £399.99

Commodore 1701 Monitor



£230

Commodore MPS802 Printer

SPECTRUM PRICE £345.00



MPS801 Printer

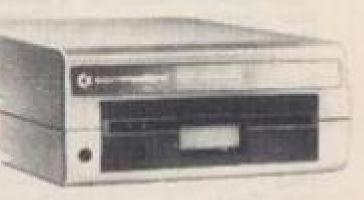
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1542 Disk Drive

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1530 Data Recorder



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1531 Data Recorder

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For further information on these products - see Spe-trum's own magazine MICRO UPDATE. Ask your local dealer for a copy!

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

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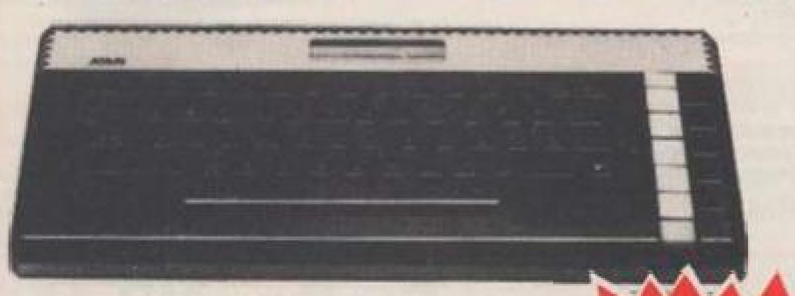
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A great line up from one of the first names in home computing...
...Now at Super New Low prices from Spectrum

Atari 800XL



• Powerful 64K RAM • Full-stroke keyboard • Full sound with 3½ octave range • 11 Graphic Display modes • Full colour (256 Colours - 128 colours can be diplayed at one time) Ask to see this super new micro at your local SPECTRUM dealer NOW!

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Atari 600XL



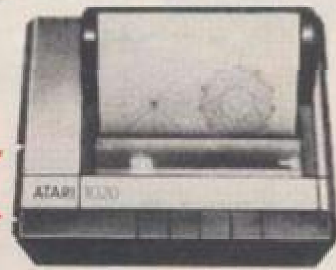
The 600XL features a 16K RAM, expandable to 64K with the memory expansion module. There's a 24K ROM operating system including ATARI BASIC. Plus 16 colours, 11 graphic modes and 4 independent 3½-octave sound synthesisers. It really is a top-value micro - come in and see for yourself!

SPECTRUM PRICE £99.99

Atari 1020 Printer/Plotter

Using 4 colour graphics and text, the 1020 colour printer/plotter is perfect for creating charts, graphs & even artistic designs. Very quiet operation.

SPECTRUM PRICE £99.99



Atari 850 Interface



Essential for more advanced work with their Atari computers. It provides 1 parallel output for a huge range of printers, and no less than 4 serial outputs which can be individually programmed for different purposes. It comes with a comprehensive manual, power pack & interconnecting cable to the computer.

SPECTRUM PRICE £99.99

Atari 1010 Program Recorder



Add storage and retrieval capability to your Computer system without spending a lot of money. Uses cassettes to store text, programs & other information.

SPECTRUM PRICE £34.99

Atari 1050 Disk Drive



Add the Atari 1050 Disk Drive for fast, convenient data access by storing on compact, easy-to-handle 5¼" disks. Storage capacity with DOS 11 up to 127K bytes, (around 100 pages) of information per disk.

SPECTRUM PRICE £199.99

Atari 1027 Letter Quality Printer

This superb Letter Quality Printer prints fully-formed letters just like a quality electric typewriter, making it the ideal word-processing companion for business correspondence. The Atari 1027 accepts single sheets of paper so you can even use your own letterhead paper.



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And many more.

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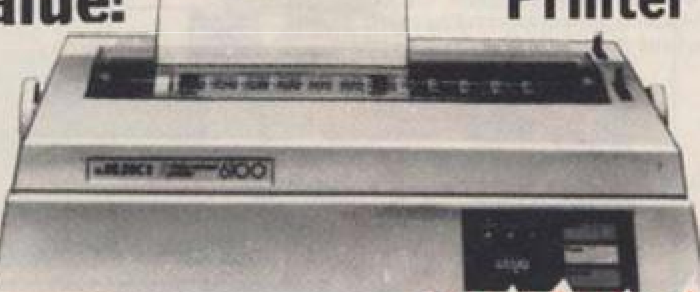
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Juki 6100

Super Value! Daisy Wheel Printer



This fabulous new printer is a real breakthrough in the performance/value stakes! For a remarkably low price you get all these great features:
• Daisywheel printing • 20cps (av. 18cps Shannon Text) • 10/12/15 or Proportional character spacing • Bi-directional friction-feed • Tractor feed or cut paper • Centronics as standard; RS232C optional • 2K byte print buffer

£399

Quendata

Just look at this for value - a true daisy-wheel printer offering top quality printing at a remarkably low price. Print speed is 18/20cps, uni-or bi-directional printing (depends on software), variable pitch.

SPECTRUM PRICE





£289.95

Tractorfeed optional extra

Other Printer Bargains

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FX80	£503.70
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Brother HR-5



Super value printer that prints on plain paper, yet still fits in your briefcase.
• Operates on 4 standard batteries
• Incorporates Centronics or RS232C
• Bidirectional or unidirectional
• High quality Thermal head
• Prints at 30cps on plain paper (with ribbon) or directly onto thermal paper
• Weighs under 2kg

SPECTRUM PRICE £159.95

Brother HR-15

A great printer at a top-value price from Spectrum. Here's what you get:
• Letter-quality daisy-wheel printing
• Between 13 and 18cps
• Bi-directional printing
• Tractor-fed paper or single sheets
• Super low price!

SPECTRUM PRICE £458.85

Brother EP-44

"Transforming Office Machines", runs Brother's slogan – with these super-compact battery powered typewriters, it's easy to see why!
• Top quality thermal printing head
• 4K of text memory (3 A4 pages)
• Text centring if required
• 15-digit LCD display for pre-printing corrections
• Line-by-line edit facility

SPECTRUM PRICE £249.95

Smith-Corona D100

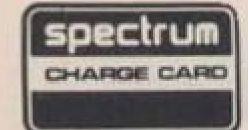


This superb dot matrix printer from Smith-Corona is a sleek, well-made machine that'll work with either tractor- or friction-fed paper. It offers a fast 120cps print speed, with 80 characters per line and a choice of well-defined typestyles. The D-100 incorporates a Centronics parallel interface.

Also available **Fastex 80** £225.17

SPECTRUM PRICE £286.35

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE



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LUTON Terry-More, 49 George St. Tel: (0582) 23391/2

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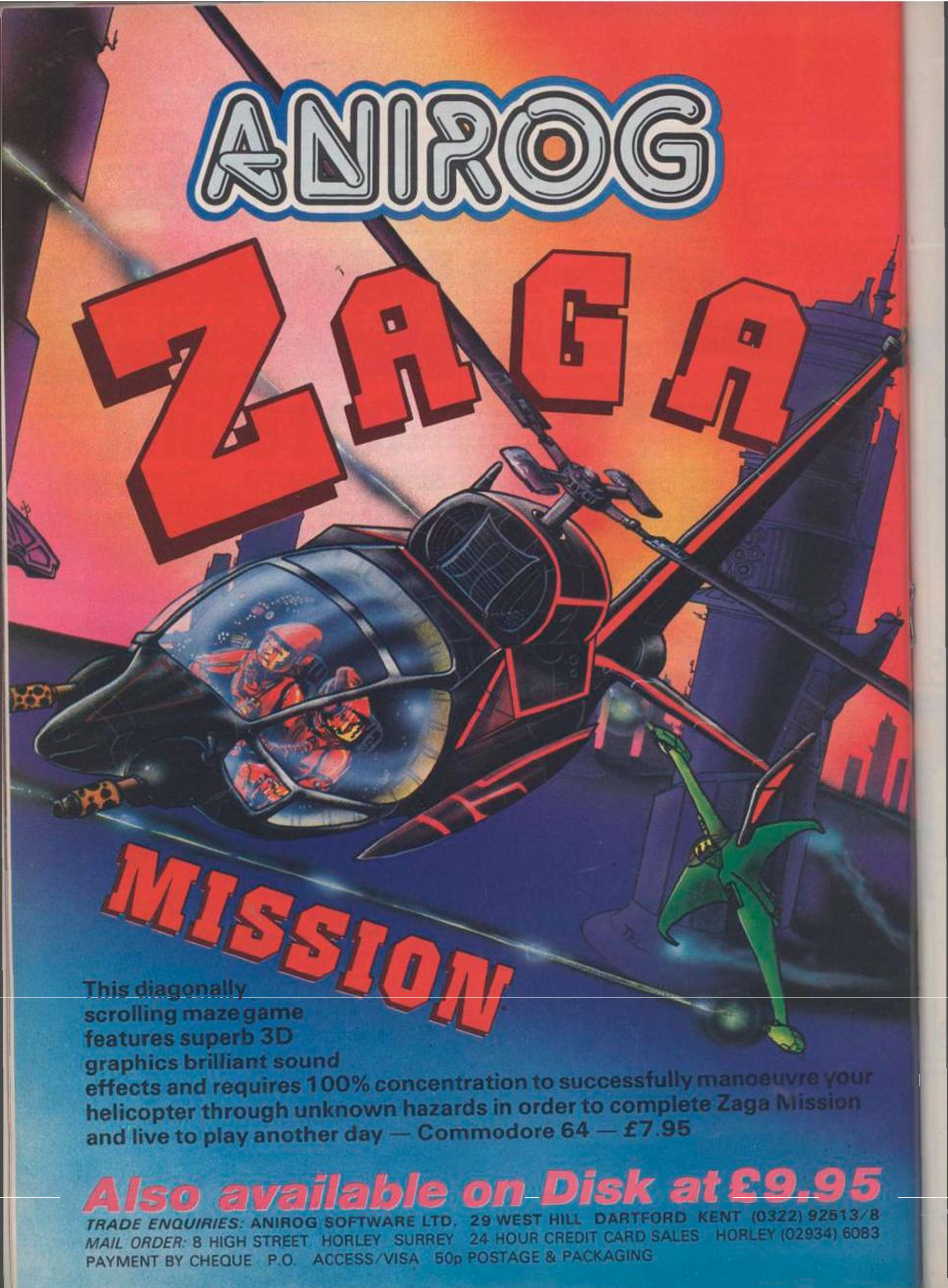
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Communicate through your modem.

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Typed in words can be spoken.

QUICKSILVA:

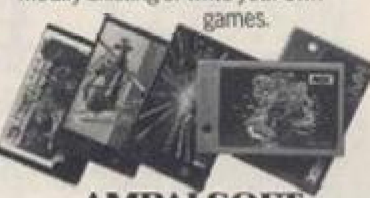
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AMPALSOFT:

The **"CHESHIRE CAT EDUCATIONAL SERIES"** of programs will be made available to MSX users.

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AXIS AT HOME WITH TECHNOLOGY

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Home Computing brings you complete compatibility in hardware and software. To cater for all home computing needs, Axis have selected in these pages an unbeatable, top value-for-money range of MSX computers, colour monitors, peripherals and software for you to choose from. "We believe that when you discover the benefits of MSX computing no other system will do".

TOSHIBA

MSX

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£249.00



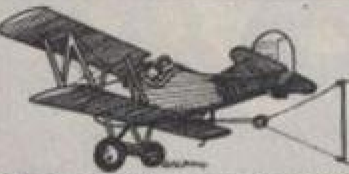
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AXIS

AT HOME WITH TECHNOLOGY

OU — BASIC IS BEST OK!



To counter your correspondents in the October issue who run down the ever popular Basic, there is another side to the debate. To take a small sample there are 23,000 Open University students with home micros, a third of them teachers and most of the rest in business and industry, with the following proportions 34 per cent BBCB, 15 per cent Spectrum, N per cent ZX-81, 6 per cent Commodore 64, 5 per cent Dragon, 4 per cent Apple, 4 per cent TI99, 3 per cent Tandy, 2 per cent each Vic20, Electron, 380Z, Atom, Pet, MZ80 and 1 per cent or less each of Genie, QL, Oric and others. They all have Basic as their *lingua franca* native language, which is easily converted from one dialect to another as Prestel, Ceefax and Basicode have shown; impracticable for other languages.

Indeed universal Basic common to all has Goto (stuff the pundits), Gosub, For.To.Step.Next, If.Then, so omit Procedure, Repeat. Until, While. Wend and Else which are not common to all. As they never teach you in 20 years, when you get down to it all, computers large and small only do three principal things:— they Loop, Branch and Gosub — equivalent to brackets in algebra; the rest is arranging input and output. As simple as that.

A recent survey among those OU students shows that 99.6 per cent do not want full time careers in computing but do "want to use their micros quickly and simply". So that means Basic, which after all was designed for that very purpose, so that the scientist, mechanic, executive or teacher could start programming within a day to help their job without a lot of elitist fuss.

It is also clear among those OU students that they have discovered for themselves, away ahead of academic staff, that programming their micros in Basic improves their studies and greatly increases their understanding of concepts in Maths, Science, Technology, Engineering, Social Science, Education, Business and Industry; and their time is at a premium.

The currently fashionable and transient structured programming and top down design — sacred cows if ever there was one; and what ever happened to yesteryear's fashionable algorithm — taught with Pascal in the OU's main computing course is a dismal failure with 51.6 per cent drop-out or failed — compare with 75 per cent normal pass rate — that is, 1163 students gave up costing £1 million of wasted resources of the taxpayers money. If the students were aircraft we would all be grounded; and if the staff who wrote the course were football coaches . . .!

It's comparable to the Army who ordered new boots and provided a sample, and then found they had 900,000 left boots only; with severe condemnation from the Parliamentary Audit Committee.

With "programs that generate programs" already on the wing there will soon be no need for these tedious, elitist and idiot fashions in structure and 30 languages; they will be as dead as yesterday's punched cards, in your lifetime. We are still in the Tiger Moth stage.

Sharpey,
OU Student,
Sussex.

AMSTRAD PEEK

In answer to Matthew Leach's letter in *Your Computer* September 1984, it is possible to peek the Amstrad CPC-464 ROM, but this must be done from machine code. The best way is to disassemble the ROM with a machine-code disassembler. Switching the ROM in with the following machine code routine.

```
ORG 4000H
CALL B900H
CALL B906H
JP start of machine-code
disassembler
```

The ROM can now be disassembled but if you return to Basic, the ROM is switched out.

M.J. Dyos,
Little Sutton,
Cheshire.

ZX-81 SPRITES

With reference to my Sprite program for the ZX-81 in the September issue of *Your Computer*, it is bug-free. However, owners of ZX-81s with the unimproved ROM will find that on running the demo program the Report Code C/100 appears. To rectify this problem the following Pokes should be carried out to the machine-code.

```
POKE 17403,82
POKE 17421,82
POKE 17435,82
POKE 17464,82
POKE 17468,82
POKE 17481,82
POKE 17485,82
POKE 17498,82
POKE 17575,82
POKE 17629,32
POKE 17695,41
```

Malachy Devlin,
Co. Tyrone.

HEX AND BUGS

I am the author of the Dragon Disco Lights program *Your Computer*, vol 4, No. 9. I would like to point out that my name is Ross not Ron as printed. Also I believe there

QL: THE BBC STRIKES BACK

I must protest at the gross inaccuracies and untrue sections of Kathleen Peel's second look at Sinclair's QL in the July issue. I quote ". . . In hardware terms, the QL currently represents the ultimate in technical achievement in the (under) £400 range . . . "

The BBC instantly springs to mind as a £400 computer; here is a comparison in hardware terms.

QL
Monitor and TV ports.
Up to 80K ROM.
Up to 640K RAM.
Up to 64 on network.
2xRS — 232 — 19200/9600 max.
2 x joystick port.

BBC
Monitor and TV ports.
Up to 256K Paged ROM.
Up to 16 megabyte RAM through Tube and 16032 second processor.
Up to 256 on network.
1 x LRS — 232 — 19200/19200.
Improved RS — 232
4 channel, 8 bit A/D converter.
1 Mhz Bus.
User port.
Tube interface.

The BBC is 1.5 time as fast as the QL. Now, which computer is the ultimate in technical achievement?

The QL may not have been on the market long, but the situation between the BBC and the QL currently is:

	QL	BBC
IEEE	Under development	two available
Modem	Under development	many available
Teletext	?	yes
Mhz bus	?	built in
User port	?	built in
Monitors	Special one needed	Any
Serial int.	2 x RS232	1 x RS432
Fastest TX	19200	19200
Fastest RX	9600	19200
Network	Does not work	Econet, E-net etc.
Max net users	64	256
IBM upgrade	no	yes
Teletext display	no	yes
Sound	?	4 channel, 8 octave
Max cols	8	8/16
Max res	512x256	640x256
Function keys	5	10 (40 with shifts)
Text	85x25	80x32
Fastest data transfer k/sec.	0.08	up to 62.5
Speech	no	yes
Languages	Super Basic	Basic, Forth, Lisp, Pascal BCPL.

The QL at this stage is totally outclassed, in every field. Given time, the QL will improve but for my money I'll take the BBC every time . . .

Stephen Corcoran,
Aylesbury,
Buckinghamshire.

is an error in the hex code; the line headed 24656 should read:

810B1027008620B6.

As I no longer own a Dragon I am unable to list this, but it should now be correct.

Ross Gardler,
Harel Grove,
Stockport.

NO COMPLAINTS

With reference to Mr Doug Bullen's letter in the September issue, I feel honour-bound to take exception to the statement that a computer's bugs are in direct proportion to the complexity and versatility of the machine.

I have owned a Memotech MTX-512 since November last year, and, to date, I have found no bugs. Perhaps the use of a Z-80A CPU, in Mr Bullen's opinion, places it outside the scope of a "versatile machine", or perhaps the inclusion of three languages resident in ROM, plus a front panel display and Logo-style graphics commands make it a little limited in his opinion?

D.J.W. England,
Wroughton,
Wiltshire.

Lines 10-170 of September's ZX-81 program were left out. They are supplied below:

```
 5 REM BARREL-BARRAGE
 6 REM MISSING LINES
10-170
 10 CLEAR
 15 DIM D$ (793)
 25 PRINT AT 6,24;
 30 POKE 16418,0
 35 FOR A=1 TO 14
 40 PRINT "            ";
 45 NEXT A
 50 PRINT "
"; AT 5, 18; "      "; AT 6, 12;"
 55 PRINT AT 22,31; " "; AT
21, 31; " "
 60 PRINT AT 0, 0; "SCORE:
000000"," HI: 000000","
LIVES: 5
 65 PRINT AT 18,22; "—"; AT
0, 0;
 70 PRINT TAB 13; "      "
 80 PRINT TAB 13; "      "
 90 PRINT TAB 13; "      "
100 PRINT TAB 13; "      "
110 PRINT TAB 13; "      "
120 PRINT TAB 13; "      "
130 PRINT AT 1,19; "      "
140 FOR A=2 TO 4
150 PRINT AT A,19; "H H H"
160 NEXT A
165 RAND USR 17130
170 STOP
```

Many people may have a problem when typing in the game, "Track Chase" which was published in the October issue of *Your Computer*.

In listing 1, lines 120 and 130 contain some funny characters which are difficult to obtain. The lines should be entered as follows:

- Type the line in as shown with spaces instead of the inversed "\" characters.
- Cursor back over the spaces, press CTRL and RVS On and replace the spaces with shifted "M" characters.
- Press Return.

The Rem statements in listing 1 must be typed in.

EDITORIAL

TILTING TRAINS THAT only work on straight tracks, Bristol Brabazons and failed perpetual-motion machines don't get much of a look in when it comes to histories of great inventions of our time.

Accounts of technological advancements are always about people getting it right first time or stumbling across something important like the theory of displacement in the bath.

It would be a shame if chroniclers of home computing paint a picture of soaring achievement when we all know the real landscape is covered with low points littered with dodos.

For example, whatever happened to the Haven colour board for the ZX-81 which offered Spectrum colour at a price you could afford? Our review in the July 1982 issue found that this product didn't quite live up to expectations: "The screen went fuzzy orange and no cursor could be seen . . . Waves of a darker colour advanced down the screen and rippled the whole display."

Haven pluckily pronounced this problem "unusual", and suggested that the colour board performed differently with different TVs: "This was confirmed by testing the board supplied with a Bush, a Sony and a Ferguson. The poor-quality picture mentioned was obtained with the Bush, but no colour picture could be obtained at all with either the Ferguson or the Sony."

However, an alternative was being advertised in the same issue: "Now you can add a coloured background to your displays!" What silicon trickery lay behind this breakthrough? Yes, you've guessed it: "High quality PVC in either blue or green. Only £2.95+pp per pack of two."

If these hardware pioneers stand head and shoulders below the rest, then Warp Factor Eight's popular add-on reached new heights: "Lift off into '83 with Hi-Stak. It makes your computing easier, faster, more reliable, less exhausting and simply more enjoyable." In its day the Hi-Stak was the latest in lumps of plastic. For £3.95 a pair the Hi-Stak stick-on legs fulfilled the claims made for them in the adverts by propping up the Spectrum to a more ergonomic angle.

But software disasters have also played a major role in the alternative history of computing. Leaving aside Space Invader — where you endlessly destroy a solitary alien struggling down the screen — let us turn to another chapter.

Bridge Software's Vic Invaders, renamed "The massacre of the saucepans" in our June 1982 edition, was too easy: "The invaders do not advance, there are no mystery ships, the base at the bottom zips along at rocket speed, and the invaders do not speed up when only a few remain."

Alternatively, there was Petals Around The Rose: "a number guessing game with a difference — it does not tell you the rules" or Neme's pontoon program which did not recognise pontoon.

Computer manufacturers should also take their share of the credit. Remember Sanyo's enigmatic PHC range which appeared in October 1982 and disappeared again in November? Or the Grandstand Tutor, the Texet TX-8000 and the Comx 35, built around the RCA 1802 chip that was more at home in early guided missiles?

If you would like to nominate a product which you feel deserves a place in the home computing house of horrors, write in to "Off-white Heat", Your Computer, at the address below. We'll publish the worst of your entires, libel-lawyers permitting, and find sutiably awful prizes for the winners.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

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Editorial: 01-661 3144
Subscriptions: U.K. £12.50 for 12 issues.

Printed in Great Britain for the proprietors Business Press International Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Tel: 01-661 3500 Telex/grams: 892084 BIPRESG. ISSN 0263-0885. Printed by Riverside Press Ltd, Whitstable, Kent, and typeset by Instep Ltd, London EC1.

ABC
154,334
January-June, 1984.

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Icon worshippers thrill to Island music



NEW PROGRAMS rarely cause excitement in the *Your Computer* office but The Music System from Island Logic had BBC enthusiasts shrieking with delight as they danced around the filing cabinets. Not only is The Music System the most advanced music program on the market it also uses Macintosh-style icon graphics to control the various elements.

Part 1 of System comprises a Printer and an Editor which allows you to word process with music — writing notes on staves and modifying existing tunes. The Editor had four voices including on disc percussion, 15 sound envelopes, choice of notation and automatic barline creation.

The Printer generates four-part music manuscript from your files so long as you have a Centronics printer. Part 2 has a Synthesiser which creates 30 tones which can be simultaneously edited on screen and a Keyboard which in addition to allowing you to use your QWERTY as a piano keyboard also allows you to record four tracks. There is also a sound and song library.

Each part can be bought separately on cassette for £13 or together on disc with a separate library disc for £25. The disc system also has a Linker module which allows you to combine single files into one piece.

This is Island's first computer program despite the fact that the company has had a dozen programmers slaving away over hot micros for the last year. A Commodore 64 version of The Music System is on its way amongst other products.

Putting a real plastic piano keyboard on the 64 gives Commodore's Music Maker an immediate appeal. For £30 you get the synthetic ivories together with a music book and a tape or disc of software which allows you to simulate eight voices with instruments such as guitar, piano and synthesiser. Set rhythms for bass or percussion backing are also available.



At the touch of a button

WHILE SPECULATION continued on whether Sinclair would upgrade the Spectrum or go for a cut down QL — "there are as many opinions on what should follow the Spectrum as there are people at Sinclair" says Nigel Searle — there seemed little chance that he would remember to include an on/off switch. There is not even one on the QL. So in the short term TEC of 24 Victoria Road, Bromsgrove, Worcestershire, are selling £5 plug-in on/off switches which clip on the top of your Spectrum. TEC claims that this positioning does not interfere with interfaces — but the Alphacom 32 printer, for instance, will not fit with the switch, and the really bad news is that not only does the new Spectrum Plus have no on/off switch but TEC switch will not fit either.

Yashica YC 64 MSX clone

CALLING ITS first home computer the YC-64 is a certain way for Kyocera to get its new MSX micro into the pages of *Your Computer*. Kyocera which makes the Tandy lap held computer amongst others is selling the YC-64 under the Yashica name which is better known in this country for cameras. The computer has the standard MSX bag of chips together with 16K video Ram and 64K system Ram.

YOUR COMPUTER TOP 20

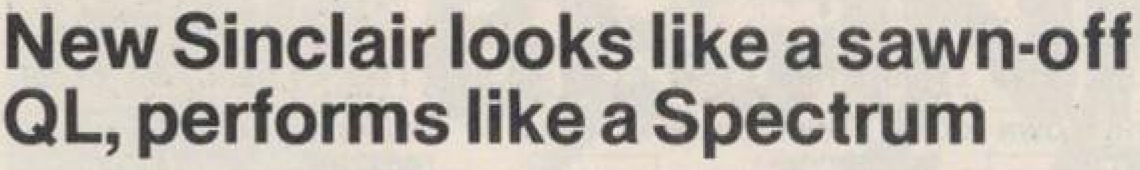
Game	Company	Machine
Arabian Nights	Interceptor	BBC
Beach Head	US Gold	CBM 64
Decathlon	Activision	CBM 64
Decathlon	Ocean	CBM 64
Encounter	Novagen	Atari
Football Manager	Addictive Games	BBC
Frak	Aardvark	BBC
Full Throttle	Micromega	Spectrum
Jack and the Beanstalk	Thor	Spectrum
Jet Set Willy	Software Projects	Spectrum
Lords of Midnight	Beyond	Spectrum
Match Point	Sinclair	Spectrum
Micro Olympic	Micro User	BBC
Monty Mole	Gremlin	CBM 64
Psycho Shopper	Mastertronic	Vic-20
Sabre Wulf	Ultimate	Spectrum
Scrabble	Little Genius	CBM 64
Tornado Low Level	Vortex	Spectrum
Valhalla 64	Legend	CBM 64
Zaxxan	Adventure International	Spectrum

Electronic books from Tandy will run on BBC

ONE OF THE strangest stalls at the Motor Show in Birmingham's National Exhibition Centre is Tandy and West Midlands County Council's joint effort. In case you need documentary evidence you can win an "I'm no Wally" certificate in a road safety competition.

Somehow this is supposed to publicise Tandy's new electronic books which plug into the Tandy Colour Computer, or with an adaptor to a BBC Micro. The books have touch sensitive pages. A £20 music book called Professor Pressnote and a guide to the planets, Solar Explorer, which costs £17 are the first two releases.





New Sinclair looks like a sawn-off QL, performs like a Spectrum



SINCLAIR'S NEW Spectrum Plus or + as he prefers to call it is nothing more than a Spectrum in a new QL style box with realish keyboard and a reset button, plus six pieces of software Scrabble, Make a Chip, Chequered Flag, Chess, Vu-3D and the Tasword 2 word processor.

The keyboard is described as "professional" but despite company claims that Sinclair was "very keen to have a robust keyboard" ours had been amateurishly put together — several keys had fallen off and were rattling around the case. The price is £180 and to encourage people to buy the Plus rather than the standard 48K Spectrum the free software deal with the standard Spectrum will be discontinued in the next few weeks. The good news is that thousands of Pluses have already been built so this time there should be no "coming soon — 28 days and counting" saga.

16K Spectrum production is increasingly aimed at overseas markets but Sinclair claims that there are no plans to stop production of the standard machine. Sinclair will be making 200,000 computers a month this winter.

Sinclair is also marketing a £100 expansion system for the Spectrum. This consists of a ZX Microdrive, Interface 1, and four cartridges including an Introduction to Microdrive use, two "business" programs, Masterfile and Tasword Two, a blank cartridge and two of the best fun programs Ant Attack and Games Designer.

One final advantage of the Plus is that is that it is the first Sinclair that can stand on its own feet. The retractable legs give you a proper keyboard angle. The original Spectrum had none and the QL's continually fall out.

Million pound bait one that got away

"EVERYONE'S JUMPING on the one million pound bandwagon" is Commodore's excuse for launching Spirit of the Stone — a treasure hunt for the Commodore 64 with a potential seven figure prize for the winner.

The £15 program and book set contains a series of arcade games which gives clues to the whereabouts of 40 talismen hidden on the Isle of Wight, each containing a single diamond. Commodore is putting 50p into the royalty fund for every cassette sold — the fund will be closed when all the talismen have been discovered or when the fund reaches £1,000,000 or failing that in 1993. Program crackers may well have an advantage over those who stick by the rules. Short of the Isle of Wight slipping silently below the waves of the Solent during an earthquake the talismen will be found well before 1993.

The million pound target is equally unlikely to be met — Commodore would have to sell more copies of Spirit of the Stones than all the 10 best selling computer games so far put together.

Not the right Habitat

IMAGINE BUYING a computer sprayed a tasteful primary colour or perhaps covered in raffia. Habitat carried out a feasibility study but decided that computer fanatics were boring people who were not prepared to pay more for trendy looking micros.

Expansion is kids' stuff

REMEMBER My Talking Computer — now there is a new £18 120K expansion module for it which contains music, sentence making, digital time, alphabet colour, shape and size amongst its programs.

Be there at blast off

SPACE SHUTTLE computer malfunctions permitting three kids will win a chance to watch a space shot from Cape Canaveral next year.

Monitor maker Microvitec is sponsoring a Cub British Schools National Computer Challenge open to teams of three contestants who must be 16 years old or less. The winners will have an all expenses paid five day trip to Florida including the shuttle launch.

Christmas is cancelled

CHRISTMAS IS CANCELLED this year and that's official. Well the *Your Computer* Christmas Fair is anyhow. The Fair which was scheduled for November 30 through December 2 at Olympia has been cancelled because most of the games and computers which used to be mail order are now available through high street shops.

From the outside it looks like a perfectly normal £40,000 Aston Martin Tickford Trekker van but another way of looking at it would show you that it is the most expensive Apple Macintosh on four wheels. At the centre of the van sits a Mac with printer surrounded by the sort of accessories every computer user has come to expect — radio phones, drinks cabinet, raised roof viewing platform, sink, stereo, drinks cabinet and swivelling leather chairs.



I could do that...

For this month's competition we would like you to write a Basic Fill routine. It should accept two inputs — giving the x and y co-ordinates of a point within an enclosed shape — and then proceed to fill in all the pixels within that shape. To make your task easier the routine only needs to handle convex figures — that is, figures whose outlines do not "turn in".

Perhaps the simplest aproach to the problem is to move from top to bottom filling in horizontally up to the left and right outline. Another possibility is the "grass-fire" method where you spread out in all directions from the centre, keeping a record of filled pixels in an array.

Whatever approach you adopt you will need some way of detecting what is on screen. Spectrum and BBC owners can use the Point command while Commodore owners will have to Peek the screen memory. On the ZX-81 you can use
PEEK 16396 + PEEK 256*16397
to find the start of the display file.

In awarding the £15 prize we will be looking for programs that do the job quickly and in as few lines as possible. Obviously if your machine already has a Fill command we expect you to ignore it.

September's competition asked you to write a program which would conduct a conversation between you and your machine. Some highly amusing conversation pieces were sent in. Typically the dialogue took an abusive turn with the computer heaping scorn on human intelligence. Most of these were, unfortunately, too long to print. Although the programs kept within the 20-line limit their Data statements were massively long.

Instead we plumped for a mini-version of Animals by Andrew Babbington, 31 Glen Iris Avenue, Canterbury.

BEGINNERS first bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

Robots

EVERYBODY KNOWS what a robot is. It is a machine with arms and legs and a tinny voice. If it is really good, it might make it into the android class. That, anyway, is the picture most people have from films and books. The reality is slightly different, though there are signs that it will become just as exciting over the next few years.

Surprisingly, the idea of a robot has been around for more than 60 years. The word was first used by the Czech playwright Capek in his play *Rossum's Universal Robots*. Robot comes from a Czech word meaning "work". The next landmark was in the 1940s, when the American writer Isaac Asimov formulated his three Laws of Robotics:

- A robot may not injure a human being, or through inaction allow a human being to come to harm.
- A robot must obey the orders given to it by human beings, except where such orders conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First and Second Laws.

Robots became a reality in the 1950s. They usually consisted of hydraulically controlled arms that performed a fairly simple task again and again, without variation.

In many ways, these first robots were simply glorified pieces of machinery that you might find on any assembly line. The big breakthrough came when the newly-developed computers were hooked up to robots. This gave them a certain life of their own and brought them one step closer to the all-singing, all-dancing metalman.

A true robot has three basic properties. Apart from the mechanical

(continued on page 47)

I'M NICKING YOU FOR BREAKING THE FIRST LAW OF ROBOTICS.

Andrew Babbington's winning mini-version of Animals.

```
100 DIM A$(512)
110 LET A$(1)="fox"
120 LET N=1
130 PRINT "Think of an animal..."
140 IF A$(2*N)<>"" THEN GOTO 250
150 PRINT " Is it a ";A$(N)
160 INPUT X$
170 IF X$="yes" THEN PRINT " One up to me!!"
180 IF X$="yes" THEN GOTO 120
190 LET A$(2*N)=A$(N)
200 INPUT "  Then what is it";A$(2*N+1)
210 INPUT "  Give me a question that would be true f
or a "
220 PRINT "  ";A$(2*N+1);" but is false for a ";A$(2
*N);" ..."
230 INPUT A$(N)
240 GOTO 120
250 PRINT "  ";A$(N);
260 INPUT X$
270 LET N=2*N + ABS(X$="yes")
280 IF N<256 THEN GOTO 140
290 PRINT " Too much, I quit!"
```

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Buffer Adventure
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(continued from page 45)

side of things you need some sort of sensory device to tell you what that mechanism is doing, for example how far it has moved its arm. Then you need a computer to analyse that information, decide what to do on the basis of it, and instruct the mechanical parts accordingly.

The same basic principles apply to home robots. To qualify for membership of the robot club, they need some kind of mechanical action controlled by a computer that can react to the outside world. Mechanical action includes simply moving.

Perhaps the simplest examples are some toys from Prism. These micro-robots respond to sound or infra-red light by hopping or wheeling along. In this case the mechanical element is slight, as well as being pretty useless, so the computer power is also small. But they do fulfil all the requirements.

More sophisticated home robots include models like Hero, Topo and RB-5X. They are also rather more expensive, costing up to £3,000 — so robotics has a long way to go before you can buy the equivalent of Sinclair's £100 Spectrum micro.

Topo is actually more of a robot peripheral than a true robot. It has no independent computational power on board, but is controlled via infra-red signals from a standard Apple II computer. Topo has a younger brother called Fred who is even dumber — aren't they all? He can just about manage to hold a pen and draw with it, which is hardly in the R2-D2 class.

Hero and RB-5X are very similar to each other in design. They both have an on-board processor, a robot arm, and various sensors. Hero has a sound sensor and a light sensor. RB-5X also has bumper devices around its base to detect collisions. Both machines can be programmed to respond to feedback from the outside world.

For example, you could get the robot to move around a room, manoeuvring its way as it bumps into objects. It could then store the layout of the room and the objects, and so avoid them in the future. Or you could program it to move towards the brightest light in the vicinity, or even to the nearest human being, using its infra-red sensors to detect heat given off. Eventually robots could be used in the home as untiring watch dogs, responding to the slightest noise, light, or heat from human bodies.

The big breakthrough in home robots will come when they can respond to spoken commands. After all, it's not much fun having a robot do everything for you if you first have to program it in machine code. The first few steps have been taken in this direction. For example Hero has a voice output facility which allows you to create words and sentences.

The home robot has some way to go before it is an everyday sight, but some people think that the situation now is rather like that of micros about 10 years ago. The models that are around are crude and not very powerful, but with great promise. So far it has been hobbyists who have bought them, quite content to get down to the nuts, bolts and chips level. But the next generation of machines could be as cheap and as useful as micros are today.

If you want to get a taste of this world, but can't quite afford the £1,600 for Hero in kit form, there is an alternative. For some years now, the micromouse competition has been flourishing in this country and abroad. A micromouse is a small powered device with sensors and an on-board computer, that tries to find its way to the centre of a maze. It is, in fact, a fully-fledged robot.

To build your own, you could do worse than follow the example of Alan Dibley, the U.K.'s leading micromouser. He uses plywood, balsa and card for the chassis, infra-red detectors and old Sinclair computers — literally sawn-off to fit on the wheeled assembly.

A micromouse competition is held each year at the Earl's Court Computer Fair in June. Alan usually wins. If you feel like challenging him, you can obtain more details of the micromouse competition by writing to John Billingsley, Department of Electrical and Electronic Engineering, Portsmouth Polytechnic, Anglesea Road, Portsmouth PO1 3DJ. Entry is free.

BEGINNERS first bytes

Speech synthesis/recognition

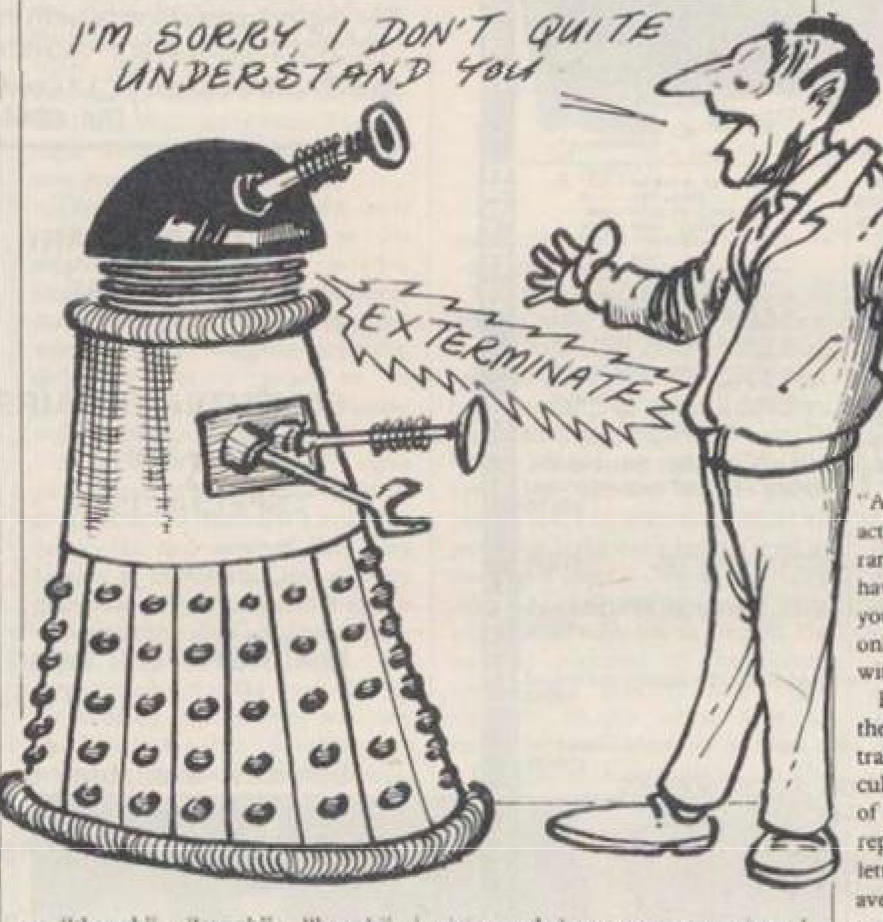
MOST HOME COMPUTERS will make a noise at you if you try hard enough. Some, like the BBC Micro, have a full three channels of music to serenade you with. Making your micro talk is a little harder, but by no means impossible.

As with most things to do with computers, the secret is to spoonfeed it. Words are broken down into their basic components. The micro then produces each of these, one after another. The fundamental elements of spoken words are called phonemes — hence the saying "don't phoneme us, we'll phoneme you".

For example the word "speech" has five: one each for "s", "p", "ee", "t" and "ch". It is relatively straightforward to program a micro to accept words broken up into these elements, and then to produce something like the right sound. The effect is the "I am a Dalek" sort of voice. Speech synthesis units are available for many micros including the Spectrum and BBC.

To get a micro to produce spoken output directly from the word itself is much harder. At the moment only relatively large systems can even begin to try to cope with the problems.

These are easy to describe and difficult to solve. Basically the spelling system of the English language is a mess. Just consider the group of letters "ough". How is a computer to cope with pronunciations as different as "though", "rough", "bough", "thorough" and "through" — not to mention "hiccough", pronounced "hiccup"?



The answer is that the computer has to do it the way we do it, by the context of the surrounding words. This leads us into the realms of Artificial Intelligence, and an area where research is only just beginning to produce results. Clearly, though, the benefits could be enormous. For example it would be easy to adapt any program to work with the blind, giving verbal messages or warnings. It would be possible to scan a printed document or book and have the micro "read" it out, doing away with the need for costly Braille books.

If a computer could give spoken messages, it would obviously be convenient if it could also obey spoken commands. The difficulties here are even greater than with speech synthesis. First there are technical problems of picking out the speech from the background noises. Slurring is a problem too. You may think you say "Africa and Asia" but most people actually say something nearer "Africa rand Asia". Finally, and worst, we have the problems of ambiguity: did you say "there" or "their"? Again, the only answer is to endow the micro with a bit of intelligence.

Rather than go the whole AI hog, there is a half-way house. You can train a computer to recognise a particular voice, saying a limited number of particular phrases. You do this by repeating a phrase several times, and letting the micro take a kind of audio average of the sound. This is stored together with the appropriate command it represents. When a spoken phrase matches this average closely enough, the micro will respond by carrying out that command.

Apart from the difficulties of distinguishing similar sounds, there is also the slight problem that this system only responds to the basic words it knows. So "delete" and "don't delete" will have the same effect on your precious files. Which is why you really need to give your micro that bit of intelligence. ■

If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Leytonstone

The East London Amateur computer club has catholic tastes; it caters for all micros, from Nascoms to Apples. It meets on the second and fourth Tuesday of each month. The venue is the main hall of the Harrow Green Library, Leytonstone. Interested parties should ring Fred Linger on 01-554 3288.

Orpington

State-of-the-art Orpington Computer Club can be contacted on Mailbox No. 068931263, or further details can be accessed on Clubspot 800 on frame 800841142. However, if your technology is still firmly rooted in the past you could always trying phoning Tony Self on 0689 31263. They meet at Christchurch Hall in Charterhouse Road, Orpington every Friday. The club caters for a wide range of machines and interests.

Congleton

Congleton and District Computer Club meets on alternate Mondays at "Heather Brae", Sandbach Road, Congleton. Hardware and software discounts are available to members and a wide range of projects are under way using BBCs, Spectrums and Commodores. Contact Tony Harratt on Cheshire 6758.

Chinor

A new user group has been set up in the Chinor and Thame area of Oxfordshire. Users of all ages and machines are welcome. The group organises lectures, competitions and games evenings. It also hopes to start a library. It meets every other Thursday at Mill Lane School Hall, Chinor. Further details from Bryan McAlley on 0844 52428.

COMPUTER club

Lee Paddon finds himself depressed in an out-of-season Southend-on-Sea until he discovers the secret of BBC's Elite at the local computer club. Perhaps he could give Simon Beesley some tips — see page 60.

SOUTHEND-ON-SEA can be a depressing place out of season. The still-lit illuminations glare mournfully down on any remaining tourists who might have got the month wrong and still be found wandering along the seafront.

Just a few yards along the seafront from the pier stands the Esplanade Hotel, looking suspiciously like a large pub. It is also the home of Southend Computer Club which can be found by entering "Go North" after you reach the bar.

Robin Knight is the chairman and one of the founders. The club was formed back in the low-res black-and-white days of 1979 when Acorn Atom's and TRS80's were the staple diet. The club meets every Monday night from 7.30 to 10.30 and has now grown to 86 members.

There was nearly as much noise coming from the club as the neighbouring amusement arcades. Decathlon is popular at the moment and several young Olympic hopefuls were furiously waggling joysticks; definitely not a game to be undertaken without rigorous training and a thorough medical beforehand.

Simon Rush was showing a clean pair of heals or a deadly pair of lasers to all comers in Acornsoft's new Elite game. He had attained the dizzy heights of competent, and a pretty gruesome array of accessories for his ship with three days continuous play. "Well, two-and-a-half really, my Saturday job got in the way". His tip for budding Elite players was very much down to earth: "Save the game whenever you dock"; even the aces sometimes need a quick spot of reincarnation.



Chris Pitt demonstrates his insurance quotation system based on a Galaxy 3 micro.

Robin Knight explained "a lot of games playing goes on at the moment but we hope some more serious work can take place once we move to our new venue at the Rocheway Community Centre. They've got 13 BBCs hooked up to an Econet system. We can also lock the games players into a separate room while we get on with the more serious stuff in peace and quiet." One of the club's first jobs will be to write some educational software to exploit the teaching potential of the Econet system and possibly help other members of the centre take an interest in micros.

Enough of future plans. At the moment the club struggles along with a collection of black and white T.V.'s and a large toolbox. However, this lack of equipment was made up for by the members who seemed to favour disc drives.

This apparent affluence might have something to do with Steve Sullivan, one of the club's founders, who runs a local shop called Estree Software which offers generous discounts to club members.

There was a notable lack of copying going on. Robin Knight explained "At the last meting we decided to outlaw it. We simply switch off the computer of anyone seen doing it. This seems punishment enough as it takes a fair amount of patience and hard work to copy a program."

Away from the games players, Stig was demonstrating his dexterity with a screwdriver and a soldering iron as a tape recorder underwent emergency surgery. By the end of the evening the patient was alive and well again and demonstrating a program analysing Stig's taste in contemporary music in terms of a line wandering around a telly screen driven through his Spectrum's ear socket. "I started mending really old tape recorders but my Mum decided I should get up to date and so she bought me a copy of *Your Computer* — the first time." Needless to say Stig has never looked back.

For more information about the club, contact Robin Knight on Southend-on-Sea 335747.



The Spectrum section in full swing — the game's the thing.



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Star★chart

Battle of Midway

PSS
Wargame
CBM-64
£9.95

★ ★

A flawed attempt to recreate the famous Battle of Midway. All you have to do is sink the four Jap carriers and they all troop off the map, victory to you! Well, that's the idea. So how come after sinking four carriers you then get hit by their aircraft and lose the game? Some nice touches of presentation, easy to order units Eastern Front fashion, but fatally flawed as a simulation.

H.E.R.O.

Activision
Shoot-'em-up
Spectrum
£9.99

★ ★ ★

Assuming anyone ever goes down a coal mine again, you may be called upon to rescue them if they get trapped. Our hero has to drop down mine shafts, blowing up a wall here, zapping a nasty spider there, and so on till he saves his man. Sounds simple enough, and it is to start off with. However, each successive shaft is harder. In some the walls are deadly, in others you can't even see the walls!

Ancipital

Llamasoft
Arcade Adventure
CBM-64
£7.50

★ ★

A silly scenario. A crack squad of Ancipitals have to go around breaking down walls whilst various other things try to stop them. There are 81 rooms in all. Fast, with good graphics and sound. Not terribly original, but enlivened by the usual Jeff Minter humour. The way you knock down walls changes with every room, movement and firing is a bit tricky.

SOFTWARE Shortlist

Interdictor Pilot

Supersoft
Commodore 64
Simulator
£17.95

★ ★ ★

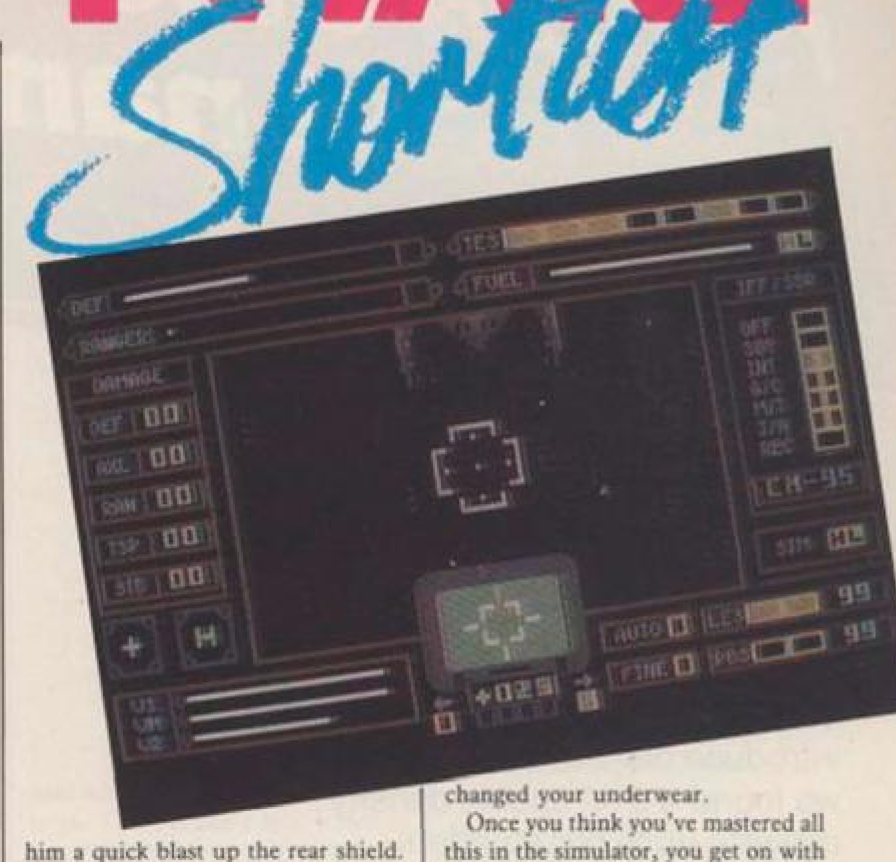
SIMULATOR AFFICIONADOES need no longer feel earthbound. Interdictor Pilot claims to give you all the thrills and spills of zapping aliens plus have all the usual features you'd expect from a simulator.

Be warned, however. This is not the sort of game you get to grips with in an afternoon; the 50-page pilot's manual gives that away.

In order to keep down the body count, you are thoughtfully provided with a simulator with which to practice zipping around the cosmos. The simulator even allows you to slow things down and freeze the enemy while you walk up to him and shoot him. This thoroughly unsporting option didn't seem to work on the review copy.

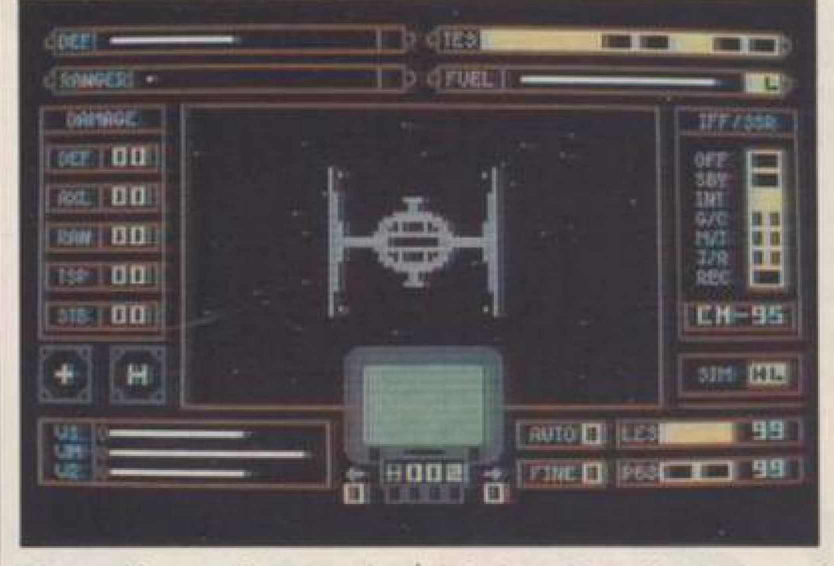
Still, being unsporting and underhand is something you learn all about in this game. You have a device called a transponder which identifies you, and you to your enemy. However, interdictors have the ability to change their call sign. So the idea is to slowly move up to the unsuspecting enemy, then give him a quick blast up the rear shield. Works every time, unless that is he does it to you!

Like any simulator worth its salt, there are plenty of controls to play with and instruments to watch. You have 20 controls to play with and a dazzling array of instruments which tell you everything from the I.D. of the nearest ship to the day you last changed your underwear.



Once you think you've mastered all this in the simulator, you get on with the real thing, life and death stuff.

Having zapped all the bad guys, now you get the hard part. Between you and getting some shuteye at the local spacepost are the automatic space station defences — and boy, are these lads jumpy. Your course, speed and transponder must all be correct or it's curtains.



Deus ex Machina

Automata
Spectrum 48K
Unique
£15.00

★ ★ ★ ★

HOW DO YOU start to review this game? With most, you say its similar to A, or an enhancement of B; but this game is just unlike anything you've seen before, there is no reference point.

The plot goes along these lines. Just before the last mouse on earth died, it climbed into this machine, and had, well, a slight accident. You must, as some kind of life force within the machine, guide this accident through to becoming some sort of life form. Weird, huh? All this is done in synchronisation with a sound track which features such luminaries as John Pertwee, Ian Dury and historian and nuclear disarmament campaigner E.P. Thompson. John Pertwee is the main narrator, and guides you through the game with a sort of space-age version of The Bard's Seven Ages of Man.

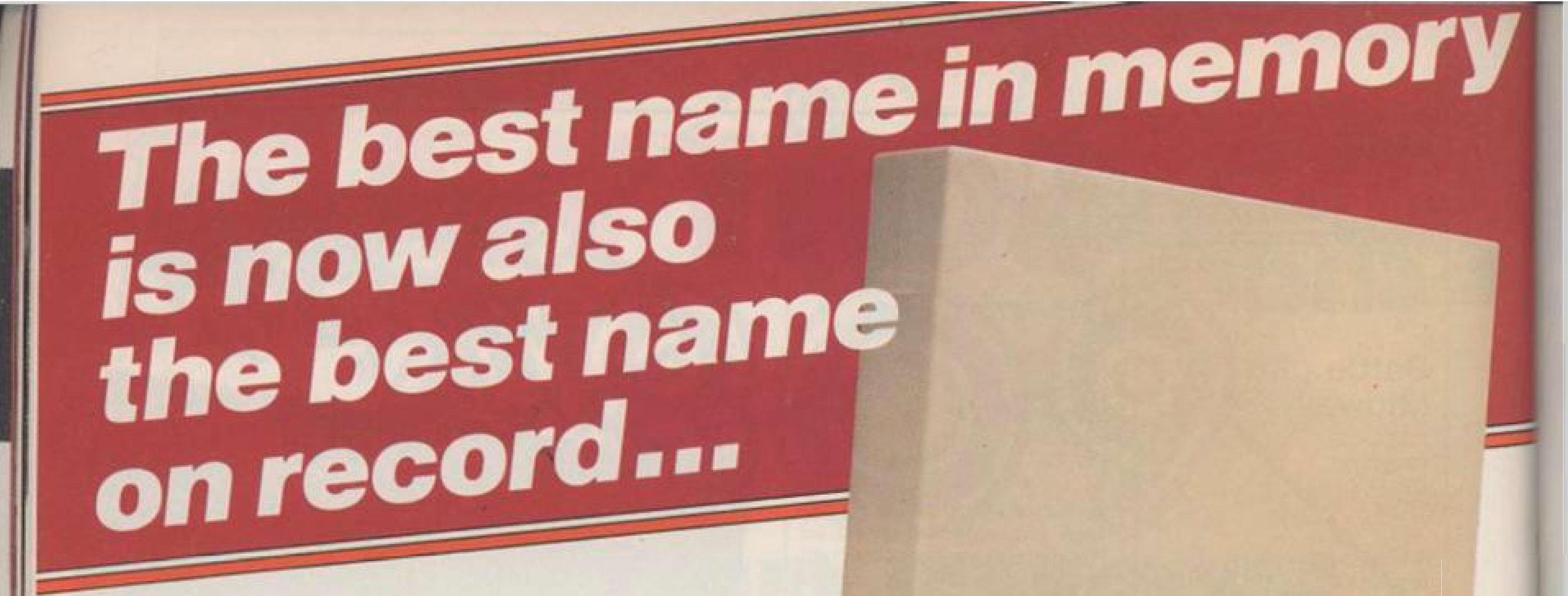
During each of these seven ages, some ill will assail your little accident as you guide it through life. How well you cope with your task is reflected in your rating which you take on with you to the next section of the game. Eventually it is hoped, you will make it to the end in some kind of shape, expressed as a percentage.

The graphics in this game are quite outstanding, considering the limitations of the machine and really add to the overall flavour of the game.

Automata have without doubt produced something which is totally original here which might just give the software industry the creative jolt it so badly needs. Non-sexist, non-racist and non-violent: it should have come with a 'G.L.C.-approved' label. No longer is it the mind-numbing business of going about slaughtering anything in our path, before it kills us, the mentality induced by many games. This game is trying to show how the computer game can be a stimulus to the imagination. I just hope they don't start interviewing computer programmers like pop stars: "Could you explain the meaning of your latest game to our viewers" stuff.

It certainly is a very enjoyable game, however, it may not be the sort of addictive game you play hour after hour.

Few computerniks will be able to resist playing God with their machine.



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SOFTWARE Shortlist

Star★chart

Star Commando

Terminal Software
Amstrad CPC-464
Shoot 'em-up
£8.95

★ ★

If MAT is an example of the evolution of a game, I'm afraid I have to say that Terminal Software's Star Commando is an example of relative degeneration. The highlights of this program for me was entering a sector on which no data was available and being attacked by a bunch of giant strawberries. This is yoghourt making on the grand scale. As a conventional shoot-'em-up, it's fine.

The screen shows a head-on view of attacking aliens, together with power, score and danger level displayed in a square at the base of the screen. The long-range scan option is just a disguised way of opting for different screens and strategy does not come into it. Frankly it's hard to see how a galaxy run by giant strawberries could be any worse off than it is already.

Roland in Time

Indescomp
Amstrad CPC-464
Platform game
£8.95

★ ★

Roland In Time from sunny Spanish software house Indescomp is an Amstrad original. Sadly it's not all that original and the graphics are not as interesting as the company's implementation of Roland on the Ropes — or Fred, as he is known on the Spectrum.

A timewarp facility catapults you into different frames of a ladders-and-levels game. The frames have titles like "Roman Fort", "Njorl's Dragonboat", "Seen my Ballista?" and "West of Dome 9". You move around picking up power pills and trying not to bump into nasties.

American Football

Argus Press Software
Spectrum 48K
Sport simulation
£9.99

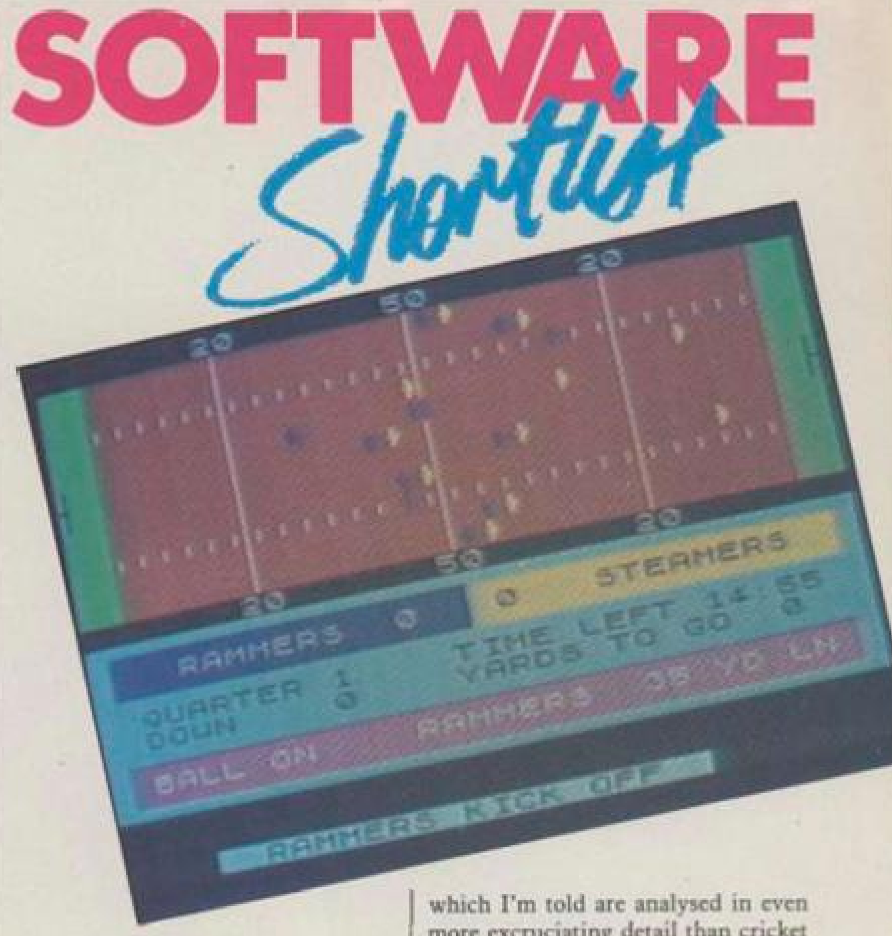
★ ★ ★

American football simulations have been around almost as long as Lunar Landers and Hammurabis. Essentially, this offering from Argus Press is simply a refinement of this hoary old classic with some nice touches and pretty graphics thrown in.

The instruction book contains the basic rules for American football, along with a phrase book to explain the essential slang of the game to the ignorant Limies. Then on to the game proper with an explanation of what to do. The game can be played against the computer or by two humans. The attacker selects a play in secret and then the defender enters his play. By comparing the two, and introducing a random element, the computer works out the results of the play, whilst you watch your best quarterback getting flattened on screen.

The tactics seem to be to try and run for the first few 'downs' to see if you can make the ten yards required, and only resort to a risky pass if things look desperate. Of course, this is exactly the tactic your opponent will be expecting, so you have to spice it up with the odd unexpected pass now and then.

The screen display is very helpful, showing the pitch itself, the score, time left, yards required and 'downs' to go. There is also a help screen in case you forget the two letter code for the particular play you want, of which there are 15. After the match, you get a whole bunch of statistics, which I'm told are analysed in even more excruciating detail than cricket averages. This game may well go down well Stateside, and it is probably going to remain the best version of this old classic, but for the true English man, it may soon lose its appeal.



Countdown to Meltdown

Creative Sparks
Spectrum 48K
Arcade Adventure
Adventure
£7.95

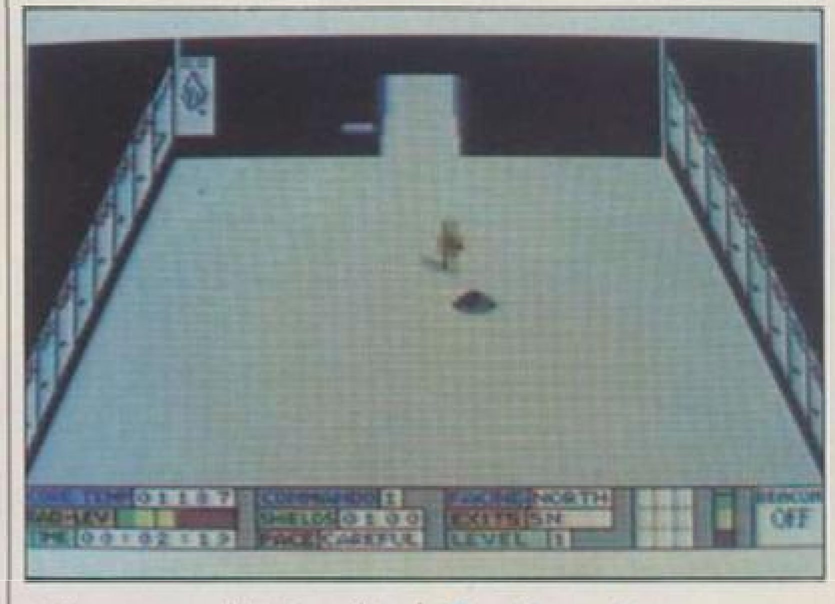
★ ★ ★ ★

Something disturbing has happened at the local nuclear power station, there's been a bit of an explosion and most of the human staff have been killed. However, there are still a bunch of aggressive androids hanging about trying to stop your bunch of androids from closing down the plant before you all get blasted to kingdom come.

Your job is made no easier by the fact that someone has inadvertently lost the plans so you don't know where the core room is; also the radiation level is rising all the time, which is no fun, even for an android.

A description of the scenario hardly does justice to the game. There are two thousand rooms spread over eight levels. You have eight androids, only one of which you can control at a time. Each of these androids has different abilities: strength, intelligence and so on.

These abilities govern the ease with which he can use the various bits of equipment scattered all over the place. Each android can only carry eight pieces of equipment.



The game avoids the tedious adventure game "suck it and see" approach by telling you how to use each piece of equipment; none of this "try every verb I can think of, something's gotta work" stuff that we normally have to resort to.

The graphics are excellent. Although the huge number of rooms I achieved by having a limited number of room types, this is enhanced by the "Star Trek" type doors and lifts. Some of the doors are broken and have to be fixed. This can be awkward if you've got a dumb android on your hands; the unfriendly attentions of the reactor guardians do not help either.

This is a well-designed game which will hold its appeal even after you've found the reactor. Getting all the stuff you need together is fun.

Sultan's Maze

Gem Software
Amstrad CPC-464
Maze game
£8.95

★ ★

Gem Software's Sultan's Maze gives you the same down the corridor view that you get in Romik's 3D Monster Maze, but has more of a myth attached to it. Apparently the Sultan of Baghdad was robbed on a visit to England. His personal champion pursued the robbers into Hampton Court maze. You have to retrieve all the jewels, steering yourself around by the numeric keypad.

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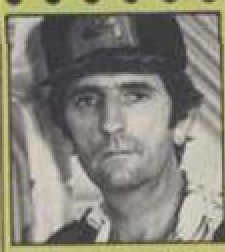
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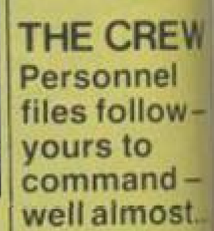
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NEWS

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The crystal ball

Coming soon from Adventure International is Spiderman, written by Scott Adams as a follow up to the successful Incredible Hulk. Like Hulk, the adventure will be text and graphics and be available for a wide range of home computers.

Scott Adams also has two others on the way — Sorcerer of Claymore Castle and Return to Pirate Island. The latter is a sequel to the earlier, and immensely popular, Pirate Adventuer.

Beyond The Infinite is the title of Digital Fantasia's latest. Expect it in your shops soon.

The Final Mission is the third part of Incentive Software's Ket trilogy for the 48K Spectrum. The earlier two were Mounains of Ket and Temple of Vran. While all three are self-contained adventures, solving all of them could win you a video recorder from Incentive in a competition to celebrate the release of the complete saga.

A helping hand

For BBC adventurers wrestling with Acornsoft's superb PHILOSOPHER'S QUEST:
Being grabbed by a sad octopus?
KNI FO ELTTOB A TI EVIG
Have you ceased to exist?
"KNIHT" TON YHW OS MA I EROFEREHT KNIHT I

For stymied players of Adventure International's THE COUNT:

Stake keeps getting stolen when you fall asleep in the brass bed?
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Coffin locked from the inside?
TES SAH NUS EHT RETFA TI GNINEPO YRT
HUGO NORTH

QUEST Corner

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The Count

BBC B
£7.95
Adventure International

ALTHOUGH THIS extremely popular adventure has been around for some time, it has only recently been converted for the BBC B microcomputer. Now owners of this micro can share in the pleasures and mind-stregching of one of the classics in the adventure genre.

Written by Scott Adams, who is something of a legend among adventure buffs, The Count sets you down in Dracula's castle, your mission being to seek out the Count and destroy him. You start the adventure in a brass bed where you have just awoken, in the afternoon, from a deep sleep. There's no point in trying to escape from the castle before you've completed the job — the local peasants will lynch you if you attempt to sneak out!

The adventure accepts the traditional verb/noun command input and the location descriptions are fairly short. But what sets the Scott Adams' adventures high above others are the tantalising puzzles and dry wit of the author. Among many bizarre objects and incidents you'll come across in The Count are a laughing bat, a bottle of blood which is delivered to the castle front door, and an unreliable flag pole.

You only have a certain time limit to accomplish the deed; watch out when the sun sets! You'll find a couple of useful hints on this testing adventure over in the Helping Hand column.

Coming soon. Swords and Sorcery — supposedly the closest thing yet to Dungeons and Dragons on a micro.

Robyn Hode

48K Spectrum
£9.95
Runesoft

NOTE THE Olde Englishe spelling — the adventure is set in the 13th century, all the place names and spelling are based on original ballads of Robyn and his Merrie Men. In fact, in order to make this adventure as authentic as possible, a great deal of research has been conducted, including reference to such historical documents as the Domesday Book and early maps.

The adventure is massive,



providing over 400 locations for you to heigh-nonney-no around. Because it is so large, the adventure comes in two parts on the single cassette, each part using all 48K of the Spectrum's memory. To get to play part two, you'll need to finish part one first — this will give you a two-part code as your password to the second half.

The vocabulary is similarly impressive — over 120 words in all — yet response is immediate. The entire program being in machine code, generated with the aid of The Quill.

The plotte: Maid Marion has been captured by the Sheryffe and held in Notyingham Castle on a charge of treason. Although it may well be a trap, Robyn decides to rescue her without the aid of his men. Can you, as the outlaw of Scherwoode Forest, outwit the Sheryffe and so save fair Marion?

If you fall, mortally wounded, Lyttle Johnne carries you to Kirklees Priory where, on your deathbed and bow in hand, you fire off a perfect final arrow through the open window before expiring. Beat that for a poetic demise! Odds Bodkins and by my troth, this is indeed a smashing adventure, highly original and beautifully put together.

Mysterious Fairground

48K Spectrum
£6.95
Buffer Micros

A QUILL-GENERATED adventure, this one has an intriguing setting. As you can gather from the title, the adventure takes place inside a strange fun fair where your objective is to recover five hidden items of treasure.

You start inside the fairground, a locked gate dashing any thought of a quick exit. A cursory trip around the nearest locations reveals a garden — I wonder if those bean plants can be watered? — a hall of mirrors, a rifle range and a ghost train.

The ghost train gives you your first major problem. Inside this ride, you experience a sense of the unnatural so shouldn't be surprised to find something unpleasant lurking there.

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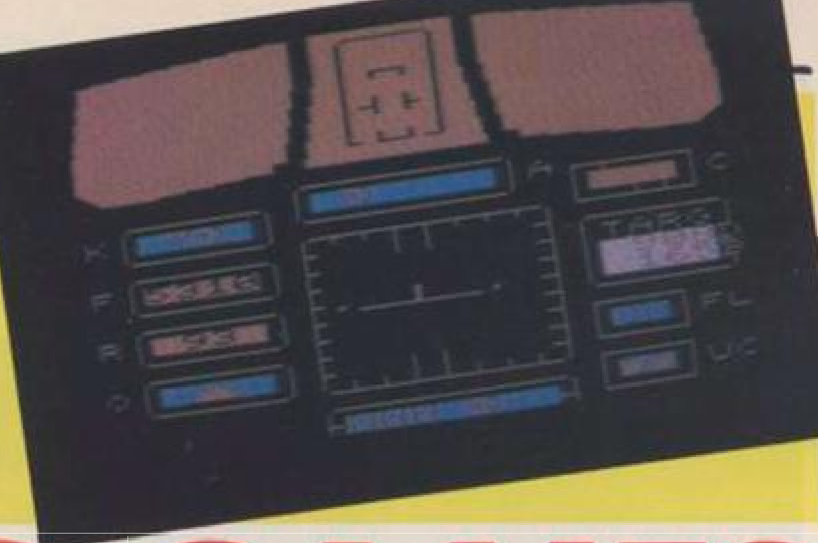
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Paul Bond wallows in nostalgia as the last Vic is rolled out of the hangar

VIC GAMES

THE NEWS THAT Commodore is to cease manufacturing the Vic-20 must have brought a nostalgic tear to the eye of many a home computer owner. It is rather like the roll-out of the last DC-3 aircraft, or the final German-built Volkswagen Beetle. It seems incredible that Commodore has already manufactured a million computers in their recently-opened Corby facility — but the company will be rolling machines off the production line at the rate of one every 2.5 seconds when up to strength. Sadly, the Vic will not be part of this great future — tomorrow belongs to the C-16.

This has not deterred the company's software arm from releasing more new software for what must be one of the world's most ubiquitous computers.

Bomber Mission, for the Vic-20 plus 16K expansion is a compact flight simulator, supposedly putting you in the pilot seat of a World War Two fighter-bomber. First, select your target — it could be anything from an armoured column to a submarine pen or a power station — then pick your weapon system: tall boys, fragmentation bombs, blockbusters.

The computer then puts up the cockpit display. It's a fly-by-instrument job, even with the extra 16K the Vic is not up to giving you much of a view out of the window, until enemy fighters turn up.

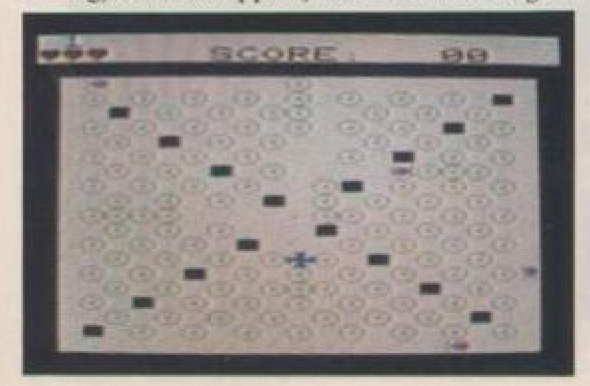
These judder about the screen in best Vic-20 rough-scrolling graphic fashion giving you an opportunity to use up your ammunition.

Over the target the bombs are automatically armed. You press the fire button and a message appears telling you the result.

You then have to turn to bearing 0 to fly home, and be sure to lower wheels and flaps above 1,000 feet and get speed in the area of 120-150 knots. I was destroyed quite a few times by pre-emptive strikes on the runway — the trickiest thing in this simulation is getting your plane off the ground before you're blown up. Each mission has a time limit and you must land before it ends. As a last gasp for the Vic-20, this program is quite an achievement — but it will bring a wry smile to the faces of Spectrum fighter jocks.

At the other end of the scale from quality software produced on behalf of the manufacturing company to ensure old hardware stocks keep moving we find the licensing trend. This is where a software house decides to let someone else have the bother of selling a line which has been around for a while.

This is good news for Vic-20 owners in the case of Omega Software — "the last word in software" — because they're doing a Mastertronics and selling everything for 1.99. Omega was the last word in Vic-20 software for Anirog, it would appear, since all the Omega games looked at for this review hail orginally from that house.



Omega's Gunslinger is, in fact, Anirog's High Noon — a four-cactus scenario where you steer your cowboy around the screen, using a joystick and 16K expansion. You are better off playing the game with another human since the micro takes a sadistic delight in shooting you dead immediately the game starts, just so it can play the funeral march. The theme music is Mungo Jerry's "In the Summertime", which should appeal to devotees of '60s novelty hits.

Battle Ground is like Space Invaders tipped

Game	Company	Price
Bomber Mission	Commodore	£4.99
Gunslinger	Omega	£1.99
Battle Ground	Omega	£1.99
Space Pirate	Omega	£1.99
Bricks	Palace	£5.99
Squish	Palace	£5.99
Dodo Lair	Software Projects	£5.95
Perils of Willy	Software Projects	£5.95

on its side. Imperial walkers move toward the right-hand side of the screen which you defend by moving behind your bases and shooting or zipping out and laying barriers in their path to delay them.

Space Pirate, which needs 16K expansion, is set in a space shooting gallery presented in perspective. The targets emerge from a box in the upper centre of the screen and weave about frustrating your attempts to put the cross-hairs square-on and blast them to smithereens. The explosions are very good, I must say. The second level includes indestructible ships which collect the target



ships, reducing your score. A neat little shoot-'em-up, good value at this bargain price.

Palace Software presents us with two "exciting and frustrating" arcade-style games for unexpanded Vic-20s, excitingly and frustratingly titled Bricks and Squish.

Squish is a shove-things-around-and-squash-icky-things game. The graphics are pure Vic-20 primitive, which is all you can expect given unadorned onboard memory. Little purple scorpion-like creatures menace the protagonist who runs about waving his arms and making the sort of footstep noises you hear between tracks on avant-garde rock albums. Twenty levels and watch out for the bug bullets.

Bricks I found more frustrating than exciting. You are at the bottom of the screen. Bricks rain down. You dodge them. The idea is to climb up using the fire button until you reach the top of the screen. You can jump up only one brick at a time, but jump down any number of bricks.

Perils of Willy, also from Software Projects, but with 16K more of elbow room is more impressive graphically. The cassette inlay tells us you are a little the worse for alcohol and you must stagger home, catching the notes of music that hang in the air. The loading screen puts up the tell-tale "Miner". It is in fact a ladders-and-levels game, with lots of jumping on to platforms, sliding along conveyor belts, and being eaten by dogs. The game is a dire warning to people who insist on seeking out the Pub of the Year in Richmond, rather than just going to their local.

Punchy from Mr Micro runs on a Vic-20 with 16K. You must guide Bobby the policeman through various obstacles to rescue Judy from where Punch has imprisoned her.

This includes jumping over spiders on the flat, catching a magic carpet across the sea, and hopping along a castellated rampart. Have you ever castellated a rampart, missus? Enough of this alternative humour. I was a little spoilt by having seen this on the CPC-464, flicker-free graphics, smooth-scrolling etc., and frankly I had a hard time figuring out what some of the things were supposed to be on a Vic. Punch could have been the Honourable John Selwyn Gummer for all I knew.

A brave try, but you know what they say about the limitations of the machine. Well, here I am, saying it again.



Paul Bond meets some old friends in new surroundings

AMSTRAD GAMES

IT'S EARLY DAYS yet, but it's clear that not only do you get a monitor for your money when you buy an Amstrad CPC-464. You also get a rapidly-expanding software base.

"Software houses tend to take promises of hardware availability with a pinch of salt," said Amsoft boss William Pole when I asked him how the CPC-464 managed to attract all this interest. "We've had Amstrad machines out at software houses since last December."

A lot of the Amstrad software consists of old Spectrum favourites re-implemented for the 464. That doesn't worry Amsoft — "We just wanted plenty of software to be around when the machine came out."

Re-implementation of Spectrum software makes sense — both machines share the Z-80 CPU; software houses' fancies may also have been tickled by similarities in specification which the Amstrad shares with MSX. Another factor which Amstrad has in common with MSX is that both will appeal to that lost generation that wouldn't have been seen dead fooling around with rubber-mat keyboards, tape recorder level controls, dodgy cables and awkward power-packs.

Yes, it's true. The built-in cassette recorder loads first time, every time — at least it did while I was looking at software for this review. One of the best games to find its way onto the 464 from its Spectrum spawning ground is Derek Brewster's Codename MAT — acronym for Mission Alien Termination as many devoted vidkids will know.

Tracing its heritage from the old grandaddy of computer games, Star Trek, via Atari Star Raiders, the game finds you in command of the *USS Centurion*. You can call up a long range scan, a solar chart and a sector scan showing a 10 by 7 grid. This galactic A-Z shows you where our boys are and what planet or satellite the evil Myons are encroaching on.

The game has two main options: you can play as pilot with deployment of Earth defence fleets under computer control: or you can play as commander — you control deployment of fleets. Moving from one part of the sector grid to another is achieved by placing the cursor over the destination point, and pressing W to engage warp drive. Tricky, this. You have to keep the cursor central on the screen or else you will end up in some galactic cul-de-sac with everybody on the bridge arguing like it's the family outing to Bracklesham Bay.

Myon fighters are easy meat for the average space cadet, but cruisers are really nippy and the motherships are mean mothers. At the higher level they attack you immediately until you zap their shields — then they retreat, recharge and return to the attack. And that is the secret of this game's appeal: the aliens are no pushover.



Strategy definitely comes into Master Chess, implemented for Amsoft by Mikro-Gen. While I doubt that this game could play those Russian boys out of town like Bobby Fischer does in the Prefab Sprout song, it is nevertheless an excellent tutor.

The screen displays the chessboard and pieces together with the current level of play on the right-hand side and a history of the 13 most recent pairs of moves for reference on the left-hand side. This scrolls upward as you play. There are 10 levels of play, numbered 0-9.

Game	Company	Price
Codename MAT	Micromega	£8.95
Master Chess	Mikro-Gen	£8.95
Monster Maze	Romik	£8.95
Atom Smasher	Romik	£8.95
Alien Break-In	Romik	£8.95
Galactic Plague	Indescomp	£8.95
Electro Freddie	Sosoft	£8.95
Gems of Stradus	Kuma	£7.95

(All except Kuma programs available from Amsoft)

An opening book of 6,000 moves is includes in the program; apparently the program can look ahead as far as 27 moves on certain opening gambits. Looking ahead is a good thing to do in a maze filled with monsters — like in Romik's 3D Monster Maze. The game which won such rapturous acclaim when introduced on the good old ZX-81 is beginning to look a little tired now on the Amstrad, as are most of the Romik retreads like Atom Smasher and Alien Break-In. Nevertheless, the latter is probably one of the best straight shoot-'em-ups around; I have even heard afficionados speak of the BBC implementation in the same breath as Zalaga — praise indeed.

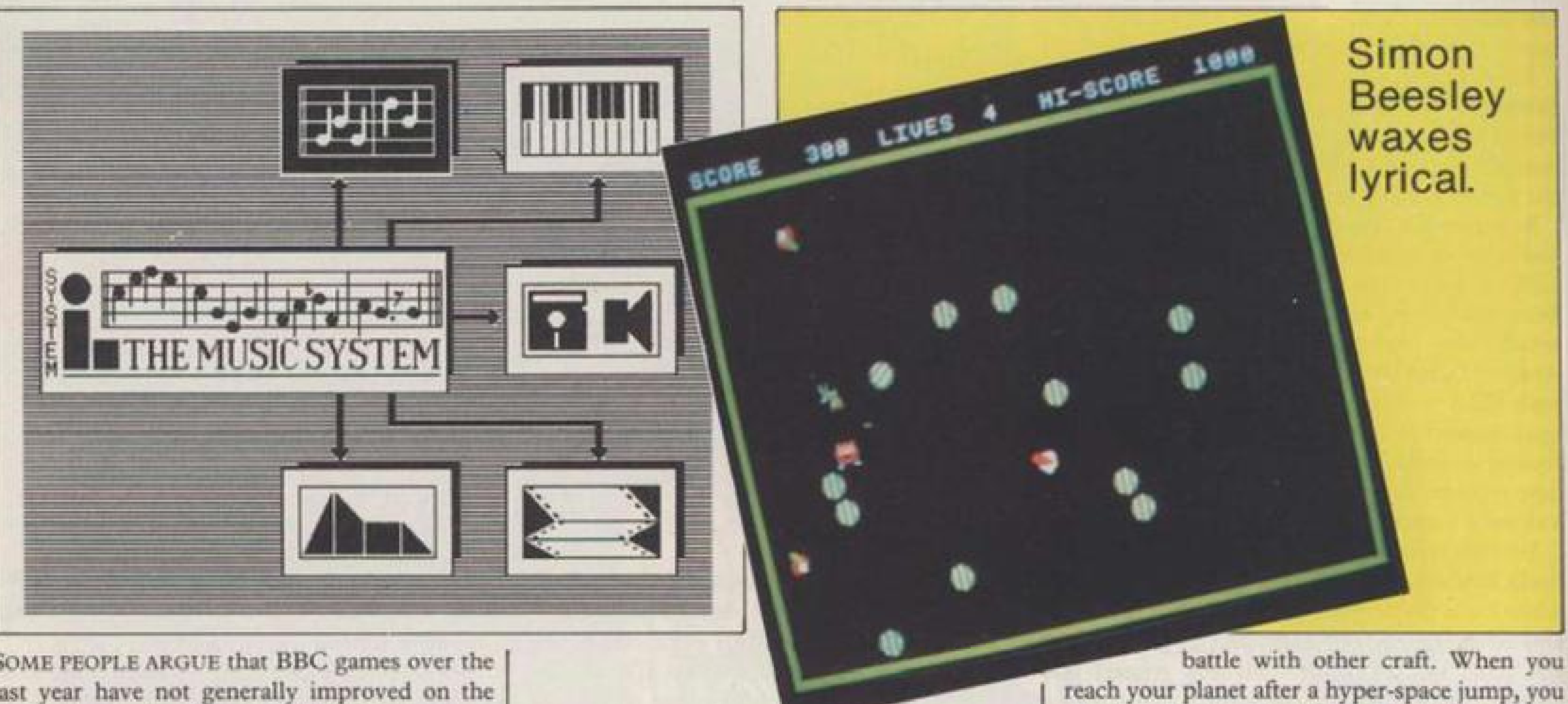
Paco Suarez, one half of Indescomp's indefatigable Paco and Paco who produced the graphically excellent Bugaboo for the Spectrum, has however created a stunning Space Invaders variant for the CPC-464. In Galactic Plague, everything happens so quickly that one is tempted to start doing Neil impressions — "What's happening, man?"

Brightly coloured space fighters zoom across the screen dropping bombs in a diagonal criss-cross wave pattern. The game seems almost unplayable, but as various strategies are developed by the player it looks possible to survive long enough to score at least 300. Wow-ee.

Your Computer has already reviewed Sosoft's Electro Freddie (Software Shortlist, October) and Kuma's Gems of Stradus (Software Shortlist, September). Protek's Hunter Killer submarine game written by Rod Hopkins in fact made its debut in Spectrum format in the August 1983 edition of *Your Computer*. Some 50 titles are scheduled for release in the next three of four months, 20 of which will appear on the Amsoft label. Level 9 are implementing most of their adventure titles for the 464 and Ultimate Play The Game were one of the first companies to get an Amstrad. The next wave of releases will include some very brainy stuff, like a sound designer and also a screen designer. The latter is from DJL, famous for Ms Pac-Man, and is described as "the Rolls-Royce of screen designers." Tasword and languages like Abersoft Forth will also arrive in time, making the Amstrad a very respectable machine indeed.

The clincher is the release of the Hitachi three-inch add-on disc drive. For less than £200 your get access to 180K of memory on each side of a disc. This and the capacity to run CP/M 2.2 will appeal to the "serious user", whoever he is. For the games player — well, average cassette loading time is about eight minutes. Discs promise eight seconds. ■

BBC SOFTWARE



Simon Beesley waxes lyrical.

SOME PEOPLE ARGUE that BBC games over the last year have not generally improved on the standard set by Acornsoft's first releases — Snapper and Planetoids. It has also been suggested that the supply of new software is about to dry up. But in fact, far from being on the wane, BBC software is definitely thriving.

In particular the space epic, Elite, marks Acornsoft's return to form. This is a block-buster of a program which combines elements of Star Trek games, flight simulators, and trader games. It also has points in common with Atari's Star Raiders — the game deemed by Jeff Minter and the editor of *Practical Computing* to be the greatest ever written.

The aim in Elite is to roam the galaxy as commander of a spaceship and by a mixture of trading and combat improve your status from "harmless" to "elite". In the trading stage you need first to choose a suitable planet.

Long and short range charts show the options while entering Status mode gives such detailed information as the nature of a planet's inhabitants, its form of government, and technological level.

Getting to a new planet, however, plunges the player into arcade action. On the way you battle with other craft. When you reach your planet after a hyper-space jump, you must first locate and then dock with a rotating Coriolis space station — a difficult feat of manoeuvering.

In the action sequences the screen manages to combine a view of space in Mode 4 high resolution with a console display below in Mode 5 colour. Planets, space stations, and other ships are shown in motion in 3D complete with hidden line removal.

This description barely conveys the scope and complexity of the game. Acornsoft is organising a monthly competition around it. Players who want to join the Order of Elite will have to study the 61-page training manual thoroughly and then notch up hours of flight experience.

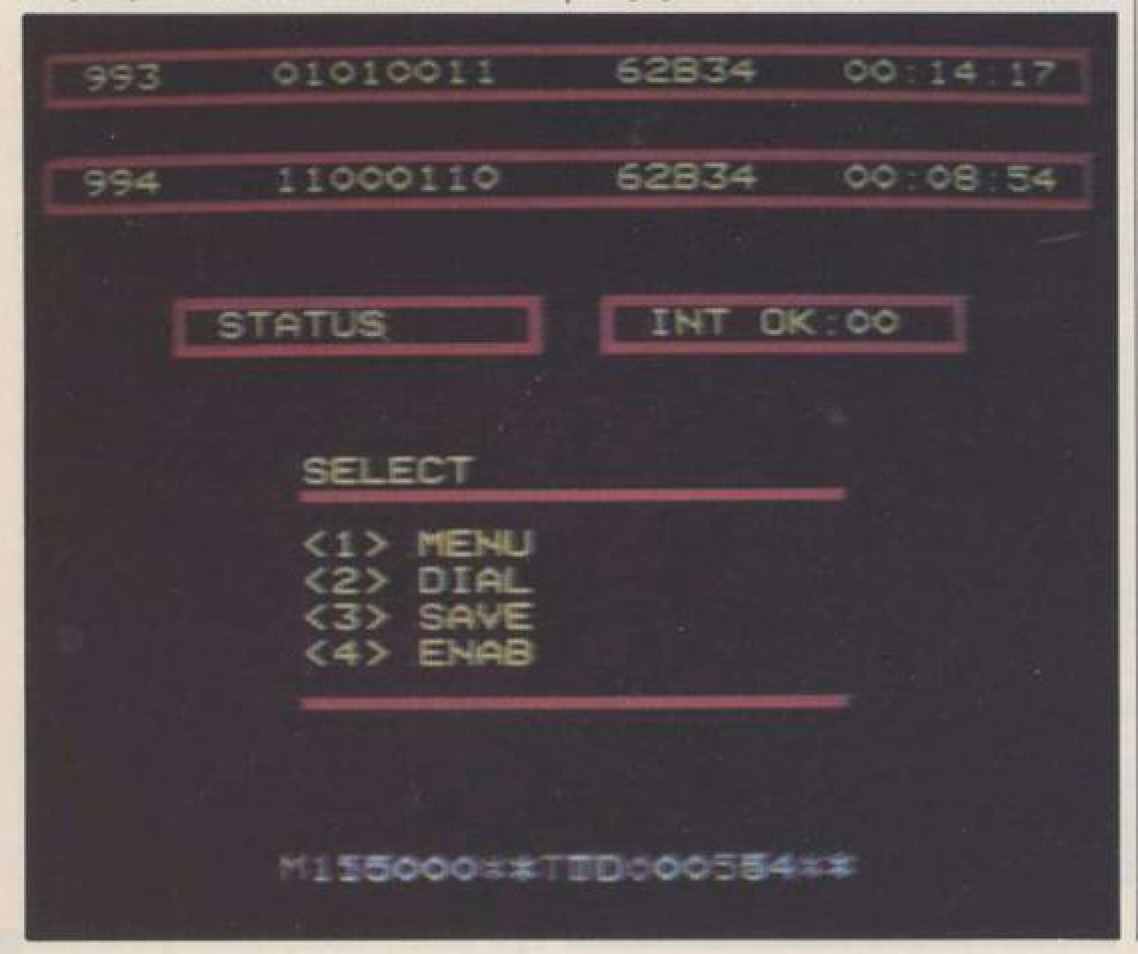
Good though Elite is it has to yield first place to Island Logic's The Music System — not a game but easily the most impressive piece of software in this month's batch. Island Logic is a new software house formed by the record company Island Records.

For almost a year a team of 12 has been working on the program. The end result is a package which makes other music programs on this, or indeed any other home micro, look crude by comparison.

The Music System consists of five programs, or modules, managed by a control program. Perhaps the most striking of these is the Editor module. Displaying some superb graphics it allows you to write notes on staves using the full range of musical notation.

Island Logic rightly describes it as the musician's equivalent of a word processor. Up to 860 notes can be entered in any one of four voices. Each note can be assigned volume and one of 15 envelopes. You can also set the tempo, transpose the key, and mark the bars automatically. Changing a note is simply a matter of pressing a cursor key to shove it up or down the stave.

When you have composed your piece you



can play it back and watch the notes scroll across the screen. Alternatively you could use the Linker module to combine it with another composition or load in a backing track.

There is a Library disc which contains a large number of predefined envelopes, rhythm tracks, and sample compositions. For a vivid demonstration of the Editor's power load in Bumble Boogie, a jazzed up version of the Flight of the Bumble Bee. Up the tempo and you can enjoy the spectacle of notes bouncing up and down the stave at a rate of 200 beats per minute.

To create new sounds there is a Synthesiser module which displays graphs of the volume and tone envelopes. In the Keyboard module you have a superior version of Quicksilva's Muproc: it lets you lay down four tracks using the Qwerty keys which it displays as a piano keyboard.

Both these features are common enough, although not usually so well implemented. Quite a new feature is the Printer module. With this you can create a four-part musical manuscript by dumping it to the printer in either high or low resolution.

Apart from its range of facilities what lifts TMS out of the ordinary is the ease with which it can be used. The entire system is driven by menus together with Macintosh-like icons. And it even includes message windows which paste over the display.

Perhaps the best tribute one can pay to TMS is that it is probably the first program that would not draw scorn from practising musicians — providing, of course, that they were not put off by the rather tinny quality of the BBC's sound.

Back on the games front, there is Acornsoft's Tetrapods, a much simpler game than Elite but in its own way just as addictive. You control an Asteroids-style triangular ship. Scattered around are numerous pods, which resemble peppermint lozenges, and a couple of Killer Bees. In later screens the bees are assisted by the more vicious Red Devils and Poison Orbs.

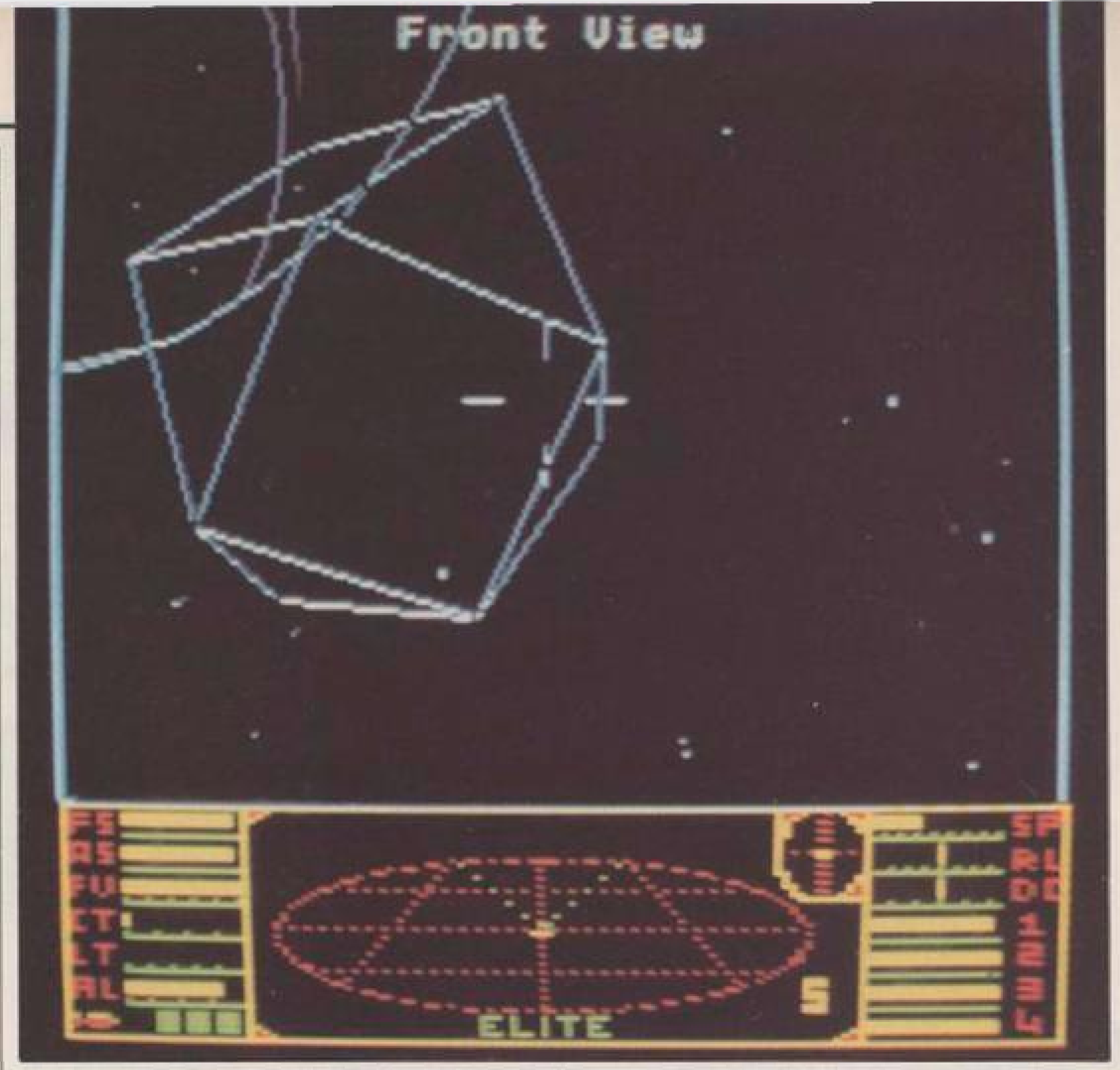
It is possible to shoot some of these creatures but more satisfying is to enlist the aid of lizards. These are what hatch out when you hit a pod. Like heat-seeking missiles they are relentless in pursuit of the nearest life-form.

To complicate matters the scene is one of constant motion with bullets bouncing off the sides, pods behaving like billiard balls, and wriggling lizards tracking their prey. It is like looking at a cell colony under a microscope.

By contrast Acornsoft's other two releases are disappointing. Drogna is a two player board game which first appeared on the TV series *Adventure Game*. Although a fun game which calls for a high level of skill, it is only marginally enhanced by being translated to the computer screen. What is needed is a one player option against the computer.

Volcano requires you to pilot a helicopter across Mount Crona, avoiding an eruption of blue rocks. On the other side are some humans who need to be carried back to safety. The graphics here are lacklustre and, while the game is challenging, it lacks variety. Acornsoft would have done better to have attempted a version of the definitive helicopter game, Choplifter.

If there is already a great game on another machine, converting it to the BBC often



succeeds better than striving for originality. Atarisoft has made a good job of translating its classic game, Pole Position.

Most of the original features are here. You are competing in the Atari Grand Prix against a dozen or so other racing cars. Crash into them and you burst into flames. Take to the verge if you like but it slows you down and you risk hitting a hoarding.

These and other effects such as gear changes and the mountain backdrop, which scrolls when you corner, are convincingly rendered. The all-important engine sounds are not quite as satisfying as they are on the original. The BBC can't reproduce the deep throaty roar of the Atari cars. And the scrolling is not as smooth. Nonetheless this is the best race-track game available for the BBC.

Converting a platform game to the BBC is not quite so easy. An essential feature of the genre is that there should be numerous different screens. But on the BBC there is not enough memory to store a great variety of screen layouts.

Durell's Manic Miner-type game, Mineshaft, gets round the problem by stripping away such extraneous details as zany flying objects, and concentrating on sheer tortuousness. The cast of hostile objects is small and many of the screens use the same conveyor belts or crumbling floors. But to make a successful jump your timing has to be of split-second

The Music System	Island Logic	£24.95 (disc)
Elite	Acornsoft	£14.95 £17.95 (disc)
Drogna	Acornsoft	£9.95 £11.95 (disc)
Tetrapods	Acornsoft	£9.95 £11.95 (disc)
Volcano	Acornsoft	£9.95 £11.95 (disc)
Mineshaft	Durrell	£5.95
System 15000	AVS	£12.95
Pole Position	Atarisoft	£9.99

accuracy, while finding the correct route is even more critical than usual.

To prove the point, one of the 20 screens — entitled The Resting Place — does without any moving obstacles. You have simply got to travel from A to B — a bit like trying to find a foothold on the North Face of the Eiger. It is a relief to discover you can move on to the next level by pressing Escape.

Needless to say this level of difficulty is just what the platform enthusiast looks for. Together with a restful soundtrack — a rendition of *Greensleeves* — and smooth animation it makes Mineshift superior to such rival games as Blagger and Ghouls.

Would-be hackers can serve their apprenticeship on System 15000. A hacker, of course, is someone like the teenage hero of the film, *War Games*, who uses a modem and the telephone system to break into computer databases.

System 15000 is the name of the simulated communications system which this game puts at your disposal. Apparently your friend Richard's company Comdata has been ripped off to the tune of $1,500,000. He wants you to save the company by breaking into a chain of computer databases.

Throughout, the game provides a convincing simulation of the hacker's task. On screen it gives a typical viewdata display. It maintains the realism by producing a telephone sound.

At the start you are supplied with the telephone number and code of a single database. By viewing this you gain leads which allow you access to others. Each may contain information about names and associated codes or vital financial and company data.

In all there are 16 databases to crack and as many red herrings along the way. Expert hackers might possibly solve the problem in one day-long sitting but it is more likely to take weeks or months. In this respect the program is like an adventure game. But otherwise System 15000 is that rare phenomenon — a genuinely novel game. ■

MSX REVIEW

MSX MUST HAVE seemed like a good idea at the time. Good for the user, who could be sure of buying a stable machine, with what was likely to prove a huge range of games and other software. Good for the manufacturer, who could avoid going out on any draughty and lonely limbs, and save on costs by sticking to components that were in plentiful and cheap supply.

But there is one tiny problem. For the whole idea of MSX to work, you have to impose fairly strict rules of what an MSX computer must and must not have. This means that all MSX machines are much of a muchness. They all run the same Basic from Microsoft, have a Z-80A processor, and use similar sound and graphics chips. So when it comes to buying a particular model, you have to choose between very similar machines.

The four micros reviewed here — three "official" Japanese MSXers, and one interloper from Korea — show the different ways manufacturers have tried to make their machine stand out from the crowd. The most obvious way is the packaging. Although every machine has the same keyboard, including special keys like Graph, Select and Code, and a cartridge slot, joystick ports and various video outputs, where you put them on your plastic box is up to you. And you certainly have plenty of room. MSX machines seem so far to have pretty greedy footprints.

One of the tell-tale signs of an MSXer is its cluster of cursor keys, set to the right of the keyboard. Sony's Hit Bit Uses four trapeziums — or is that trapezia? — arranged in a square. These are nice and large but very shallow, so you feel curiously unsatisfied when you hit them.

The Mitsubishi ML-F80 uses a similar plan, but squashes the left and right cursor. They do, however, have deeper travels. For my money, the Canon V-20 wins the day in this department. Rather daringly, it uses bold large rectangles, two large ones for up and down, and two smaller for left and right. Again, they are rather shallow, but their shape somehow compensates for this.

In fact Canon has played it big and bold throughout its machine. The five function keys doubling up to 10 with the Shift key that the MSX scheme of things demands, extend right the way across the top of the keyboard. In programming this is really useful. For example in MSX Basic, F4 is programmed as List and F5 Run. With such big targets it is easy to flick a nonchalant finger in their general direction and obtain the desired result.

The other machines all tuck the function keys away to the left-hand side of the keyboard, and use skinny little strips for keys. In-depth discussions of the width of function keys may seem completely over the top, but differences between MSX machines do really come down to this level. Most people pay far too little attention to the keyboard. After all, this is where you actually get that hands-on experience. Normally you don't have any choice. If you want the Spectrum you just have to put up with those funny rubber keys. But with the MSX range, the feel and layout of the keyboard could well be the deciding factor between machines.

MSX keyboards have much more than just the standard QWERTY keys. Most keys can generate three or four different characters when used with the Shift key, Graph key, Graph and Shift key, Code key and Code and Shift key. There is a special foreign accents key just for sticking on umlauts and circumflexes.

Other unusual keys on all machines include

AUTUMN COLLE

Blacks and greys are the MSX colours for this autumn. But can our man on the catwalk, Glyn Moody, tell the difference between the Canon, Mitsubishi or Sony styles and the £230 Goldstar's coarser cut?





CTION

such things as square and curly brackets, pound signs and Spanish tilde signs. One effect of this generosity is that Return and Back Space keys are slightly too far away if you are trying to touch-type with your hands stationary on the keyboard.

The Canon scores again in choosing to put the accents key mentioned above to the right of the right-hand Shift key. It is therefore much harder to press Return be mistake — only too easy on the other machines.

All of the MSX machines have TV, video and audio outputs, cassette port, MSX printer port, two joystick ports and a second cartridge slot which can function as an expansion bus. Ports and on/off switches are all over the place on different machines, but there are no startling innovations.

The cartridge sockets are generally in the top right-hand corner of the machine — except for that individualist Canon, who puts it in the top left-hand corner. This may well be more convenient for right-handed games players who wish to flip in mid-stream from one zapping cartridge to another without ever loosening their fevered grip on the joystick.

Moving on to the software, one way of adding something to a machine's appeal is to stick in a few ROMs' worth of software. This will leave the basic structure of the machine intact, and preserve the MSX format. Sony has followed this path with its Personal Data Bank.

On powering up the Hit Bit, you are given a short menu of choices. One of these takes you straight to Basic. The others let you use an address book and memo pad program which are held in ROM. These are not very sophisticated, but you can store about 50

(continued on page 65)

GET SET FOR ACTION

Protek Joysticks and Joystick Interfaces give you arcade-quality on the ZX SPECTRUM, BBC MODEL 'B', ORIC ATMOS & ELECTRON COMPUTERS. The perfect Christmas gift for the computer buff.





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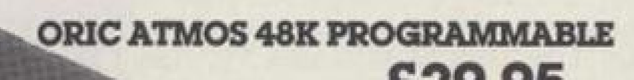
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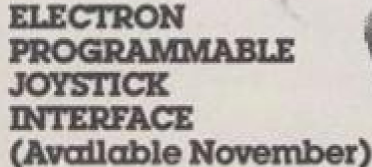
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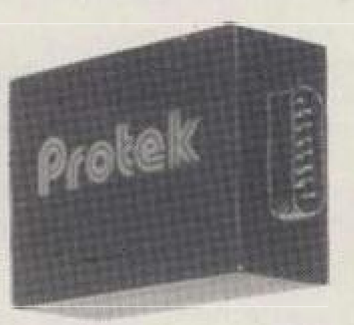
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BBC MODEL 'B' JOYSTICK INTERFACE

£11.95

Just plug this Interface into your 'ANALOGUE-IN' port and you can now use any standard 'ATARI-TYPE' Joystick including Quickshot II Joystick.









Protek Computing Ltd, 1A Young Square,
Brucefield Industrial Park, Livingston, West Lothian. 0506 415353. Telex No. 727559

(continued from page 63)

names with up to 80 characters' worth of information in the address and telephone book. You can then search through them either by name or number or address. Lists of addresses can be saved to tape or cartridge.

If these first programs are a little unimpressive, they at least hint at possible directions in which MSX micros may develop. In an effort to woo buyers to particular machines, manufacturers will probably be forced to offer more and more glamorous ROM extras.

The MSX Basic itself, of course, is sacrosanct. So there can be no tampering here to tweak its performance or facilities. But to be fair, that is not really necessary anyway. Microsoft has done a good job in providing a powerful and clean Basic. Some of the commands were discussed in detail in the Toshiba review in the September issue of *Your Computer*. Everything you would expect from a reasonably structured Basic is there, along with powerful sound, graphics and sprite commands. Out of a nominal 64K RAM, you are left with only 28,815 bytes program area. Editing is carried out simply and efficiently using the cursor, insert and delete keys.

Text and graphics modes are entered using the Screen command. The default value is Screen 0, which allows 40 columns and 20 rows. Three rows at the bottom are given over to the function key labels. These automatically switch when you press the Shift key to flip from F1-F5 to F6-F10. Screen 1 gives you 32 columns. Screen 2, the high-resolution graphics mode allows 256 by 192 pixels. Screen 3 is the low resolution mode, with 64 by 48 coarse pixel elements. The image is stable and the colours reasonable.

16 colours are available, but in the high-res mode there are restrictions as to how foreground colours may be assigned to individual bits. Another problem is that text may not be mixed directly with graphics. Graphics commands include plotting, line, circle and box drawing, area filling, and sprite commands. Up to 32 sprites can be handled at once.

Two types of sound commands are included, both of which use the TV speaker. The Sound command itself allows you to specify 13 parameters defining channels, loudness, pitch and envelope. A more civilised command is Play, which lets you input letters such as A, C, E, which are interpreted as the appropriate musical notes of that name. Altogether there are three musical channels,



and also a simple Beep command.

Other features of the Basic include a Def Fn which allows you to define additional functions, and useful programming aids like Tron which turns the program trace on, and error-trapping routines like and Erl and Err, giving the error code and the line which generated it respectively. There is also a real-time clock accessed via the variable Time.

Running a series of standard Basic benchmarks is instructive. In ordinary loops and Gotos, the MSX machines emerged as about half as fast as the BBC, and twice as fast as the Spectrum. But in one speed checks designed to test the maths routines — such as calculating sines, logs and so on — the MSX micros were markedly slower. This is mostly due to the fact that they work to 14-digit precision. This is hot stuff for a home micro, but the penalty you pay is loss of speed in intensive number-crunching activities. For games this should be no problem.

After manufacturers have done their utmost in hardware and software to make their MSX micro into an MSXtra micro, they have only one weapon left: the price. And this is where it gets interesting for you.

Since, in functional terms, there is very little to choose between the various machines, it would be perfectly reasonable to buy purely on the basis of price. Therefore, you would expect manufacturers to be locked in a life-or-death price war. Which rather goes against the spirit of gentlemanly co-operation that lies at the heart of MSX.

Alternatively, the manufacturers could come to an equally gentlemanly agreement to keep there prices roughly comparable, so that there were no gross differentials, and also to keep them profitably high. At the moment, this appears to be what is happening. Both the Sony Hit Bit and Mitsubishi ML-F80 weigh in at a hefty £299.95. The Canon breaks ranks slightly with a price tag of £279.95. These are all 64K machines. Although MSX allows for smaller RAM sizes down to 16K, manufacturers seem sensibly to be pushing the top of the range versions in this country.

This kind of tacit agreement works fine while everyone sticks to it. The danger is that some outsider will come in and use the very strenght of MSX against itself. That is, it will produce a totally MSX compatible machine, but for half the price, say. Since there will be functionally little difference between the top and bottom of the market, the intruder stands to clean up.

There are signs of this already in the Korean MSX machine reviewed here, the Goldstar FC-200. In all important respects this is identical to the honest-to-God Japanese models — except that it is £70 cheaper. True, the whole machine does look a bit like a Mickey Mouse toy version, with garish red, green and blue keys. But on powering up, the differences prove only skin deep.

Unfortunately for the Japanese manufacturers, their bright peripherals will be no help either. Sony has produced a stylish but rather unwieldy plotter costing £250, a 320K disc drive for a steep £350, and various joysticks, including an infrared one for £65. Apart from being hideously expensive, the disc drive is also rather badly designed. For reasons of cooling, presumably, the entire case is perforated with large holes — just asking for coffee or other sticky liquids to be poured in. The other manufacturers will no doubt follow suit in announcing add-ons when the machines are released over the next few months.

Peripheral MSX appeal

But again the complete compatibility of MSX means that you can use any manufacturer's equipment with another's. So once you have bought your cheap but workable MSX micro, you can then pick and choose similarly amongst the peripherals. For once, it looks as if things could be going the user's way.

Whether the whole MSX philosophy is going to result in an MSXplosion is another matter. Personally, I think that the U.K. market will prove hard to breach, largely because of local aberrations like Sinclair, and the strong Commodore following here. The new Commodore Plus 4 in particular seems to offer practically everything that an MSX micro does, but with a neater design and useful bundled software. The Amstrad, too, will be a strong rival.

But there can be little doubt that the machines will sell, and that huge numbers of games will be written for them. It could be though, that a plateau will eventually be reached where every last drop has been squeezed out of the Z-80 that lies at the heart of the MSX philosophy. It is not clear where MSX will go after this first wave of machines.

Certainly, we can expect — one day — much more exciting games on something like the QL. As ever, it really is a question of paying your money and taking your choice. ■

CONCLUSIONS

- MSX is here, and here to stay. The concept will prove more relevant to the first-time buyer than to the hardened games addict or machine-code programmer.
- The machines are sensibly designed, and have an especially good Basic. The standard of construction seems high.
- When it comes to buying an MSX machine, there are two things to remember. First, that prices are almost bound to come down dramatically from their present high levels. So wait if you can. Secondly, if you really must be the first on your street with one of these dark gleaming machines, make sure you try out as many as possible, especially the keyboards.
- As time goes on, it is also likely that manufacturers will offer an increasing number of "added-value" features. Again, check these out thoroughly before deciding.

BARGAIN BUYS — UP TO £50

These machines have been around for some time now, are about to disappear from the market and are available at very competitive prices. They are worth considering as basic entry machines to see what computing is all about.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
ZX-81 Sinclair £30	Black and white only. Touch sensitive membrane keyboard is barely adequate but this is the cheapest computer. 1K RAM. An ageing design.	Good editor with syntax checked keyboard data entry. Basic is very slow. Chunky graphics and no sound.	Lots and lots of very good cheap software considering the machines limitations.	Keyboards, joysticks, printers, lots of choice, relatively cheap. Good books. Add on memory.
MC-10 Tandy £50	Colour with chunky graphics — no user defined graphics. Sound through TV speaker. ¾ size keyboard — moving hard plastic keys with space bar.	Keyword or typed in full entry. Microsoft Basic.	There are games, not many and adequate is about the right description.	TP10 printer, also very cheap. Add on memory 16K.
SORD M5 Computer Games Ltd £50	Colour and Sprites. The MSX chip set coupled to the worst keyboard of the three colour computers. 4K 3 channel sound.	The best operating system software for a m/c Z80 programmer, access to everything. Pity about original price and keyboard. Basic is a bit weak.	Very little software available, but what there is, is good quality.	Available but only from manufacturer, no other sources.
AQUARIUS 1 Radofin £50	Chunky graphics — no user defined graphics. No sound, keyboard only a little better than the Sord.	Microsoft Basic but no editor, keyword or typed entry.	More than Sord or MC10 but again, only adequate.	Printer, memory, joysticks and discs available relatively cheaply.

COLOUR COMPUTERS — UP TO £100

The machines in this range offer more than the bare minimum performance and each has its own particular strong points. The Vic-20's software base is extensive and cheap. The Atari's software is the best, but expensive.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
ATARI 600XL £89	Very good real keyboard. Newish design. Sprites and good sound — 4 channel. 16K needs special tape recorder.	Very much better Basic than original Ataris. Nice screen editor with syntax checked data entry.	Some of the very best, but cartridges are expensive and soon cost a great deal more than the computer.	Printers, joysticks, discs, memory. Average prices — look for special offers.
VIC-20 £89	Good real keyboard. Limited characters per line 3 channel sound. 3K mem needs special tape recorder.	Limited Basic with a good line editor.	Very large number of quality cheap cassette games available. Some require additional memory.	Printer, joysticks, disc, memory, average prices.
TANDY CoCo £99	Moving key keyboard. Lowish colour resolution. 16K memory. Sound through TV speaker. RS232 port.	Line editor, abbreviated error messages show computers age.	Can run OS-9 on expanded system to provide user with mini computer feel. New learning book may be the shape of things to come.	All things available but do tend to be expensive. Can be extended to become a limited business machine.

LARGER MEMORY COMPUTERS — UP TO £150

The larger memory generally permits more extensive and better quality cassette-based games.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
DRAGON 32 £99.95	Real keyboard but feels a little tacky. Sound through TV. 32K.	Very similar to Tandy CoCo on which it was based.	Some good cheap software.	Printers, discs, joysticks etc, reasonably priced.
ATMOS ORIC £99.95	Good real keyboard. 3 channel sound.	A vast improvement over the original Oric 1 which had cassette loading difficulties.	The lower UK profile of the Oric/Atmos will not help in the availability of software.	Printers, discs reasonably priced.
SPECTRUM Sinclair (6 Pack) £129.95	Moving key rubber keyboard worst of this group, weak sound. The Spectrum is becoming overpriced in the current market.	Single keyword entry with full syntax check on line entry. Design becoming dated now.	By far the largest cheap quality software base of any UK machine. The standard by which other games are judged.	Printers, joysticks RS232 interface Microdrives etc. Generally cheap though some items could be cheaper.
AQUARIUS 2 36K £129	Good real keyboard. Limited chunky colour graphics. Sound through TV speaker.	Microsoft extended Basic with reasonable editor. Some of the feel of MSX in this Basic.	Limited software availability likely to be a problem.	Aquarius 1 accessories fit and just about everything available from printer, joysticks, memory to cheap discs.

THE BEGINNINGS OF BUSINESS USAGE — ABOUT £200

The Memotech has the ability to become a limited business machine but there is unlikely to be a tremendous amount of software for it. The Commodore has the software but not the ability. The Electron needs a fair amount of expansion which effectively changes the price bracket it occupies.

(continued on next page)

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COMPUTER	Hardware	Operating System/Basic	Software	Accessories
COMMODORE 64 £199	Average keyboard. Very good sound facilities, needs a special cassette recorder.	Minimal Basic, does have sprites but not easy to use, or sound, from Basic.	Do like cartridge football. Games tend to be more expensive than, say, Spectrum.	Everything — big selection.
ELECTRON ACORN £199	A cut down version of the BBC computer. Good keyboard. Single channel sound. Overpriced.	Runs slower than the BBC but quality Basic. Can run mixed Basic and machine code programs.	Quantity increasing all the time.	Needs expansion box before accessories can be hung on to computer.
MEMOTECH MTX £239	Very solid machine with average keyboard — includes separate numeric keypad.	Built in assembler/disassembler plus Noddy language besides Basic. Line syntax checker. Can expand to a CP/M system.	Limited in quantity but of reasonable quality.	Everything, but little choice.
AMSTRAD £240	Includes black and white monitor and built-in cassette drive. Quality keyboard and limited cassette control.	Nice operating system. Basic is quick but could be more user friendly in graphics and sound department.	Needs the colour monitor to really be used as a games machine. TV adaptor available. Some nice games.	New machine, items just beginning to appear.

TOP OF THE RANGE — ABOUT £400

These machines cover the top end of the games machine range and the bottom end of the business machines.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
BBC ACORN £399	Very old design. Not long before the new ABC's take over. Well overpriced because of captive market.	Very fast, against which all others are compared. Can run mixed Basic and machine code programs.	Not as good as specification is capable of producing. The best for educational uses.	Big choice in all price ranges. Can become expensive with a big footprint on the desk.
QL SINCLAIR £399	Uses the IBM alternative microprocessor (MC68008). The hardware is the best in the price range, still a few bugs to be knocked out.	Look out for 3rd party vendors to provide multi-user/multi-tasking o.s. that works. 4 software packages in price that are improving in quality — slowly.	Very few at present, but all the best software is being programmed for it at present. Worries about cartridges, pricing and piracy.	Needs care when choosing monitor and printer, they don't all work with the QL.
AMSTRAD £349	Includes colour monitor and cassette drive. Not always easy to read 80 column text but display rock steady. Stereo sound.	Quick Basic with nice editor easily learnt.	The B/W monitor is more suitable for business use. Some very good software.	Few at present but coming soon.
EINSTEIN £499	Includes a 500K 3" disc drive. Nice keyboard and reasonable sound.	Clean machine with Basic loaded from disc. CP/M capability.	Predominantly a business machine between the QL and the ABC's and the new Apricot.	Not much at present but it should be all available in time.
ADVANCE 86A £400	Upgradable to IBM PC compatible. Looks different from other computers with keyboard storage in main console. Good keyboard. Takes up a lot of desk.	Very nice full screen editor, the IBM standard Basic. Faster than IBM machine.	Surprisingly little for the basic machine, but masses for the full blown expanded version. Software is comparatively expensive.	Most IBM accessories are suitable, the cost is higher than other accessories listed.
ALPHATRONIC £347	Very good keyboard with excellent feel. Very limited graphics.	Full screen editor, with Microsoft Basic.	Very little, requires expansion to CP/M level before much software available.	Discs, printers etc to full CP/M compatibility.

COMING SOON

Some new computers will be launched prior to Christmas and they will have varying degrees of success in achieving a place in the market. The following group is my assessment of the machines based on a brief encounter.

COMPUTER	Hardware	Operating System/Basic	Software	Accessories
COMMODORE 16 £140	The replacement for the Vic-20. Nice keyboard, good sound.	Better Basic but a very conservative specification.	Can't help but be good. Initially certain to be cartridge and expensive. There may not be a UK driven cassette base this time.	All Commodore accessories should fit.
ENTERPRISE £250	One year on from initial showing, the impact is considerable less. Whether a better buy than Amstrad is doubtful. Keyboards on the machine I've seen poor.	Good Basic but the competition is no longer overawed by the specification.	Bound to be good, but whether there will be sufficient to sustain the machine is questionable.	Coming soon.
COMMODORE +4 £250	Very nice feel to the machine with a good keyboard. Sound facilities not up to those of the CBM-64.	4 very simply built in packages, but they are quick and usable. Better Basic than 64. Packages are word processor, spreadsheet, database and business graphics — no sprites.	Certain to follow 64 standard, only question is the availability of cheap cassette-based software.	Some differences in the connectors may mean some new accessories. Joystick ports are different etc.
MSX £250	Can be bought in any shape, colour to suit taste. Real keyboards, moving key. From 16K upwards memory.	Bound to become THE home micro standard with the ability to run CP/M software when expanded.	Already substantial and before long all new games will be here first.	Everything including the new quick discs.

First, a question.

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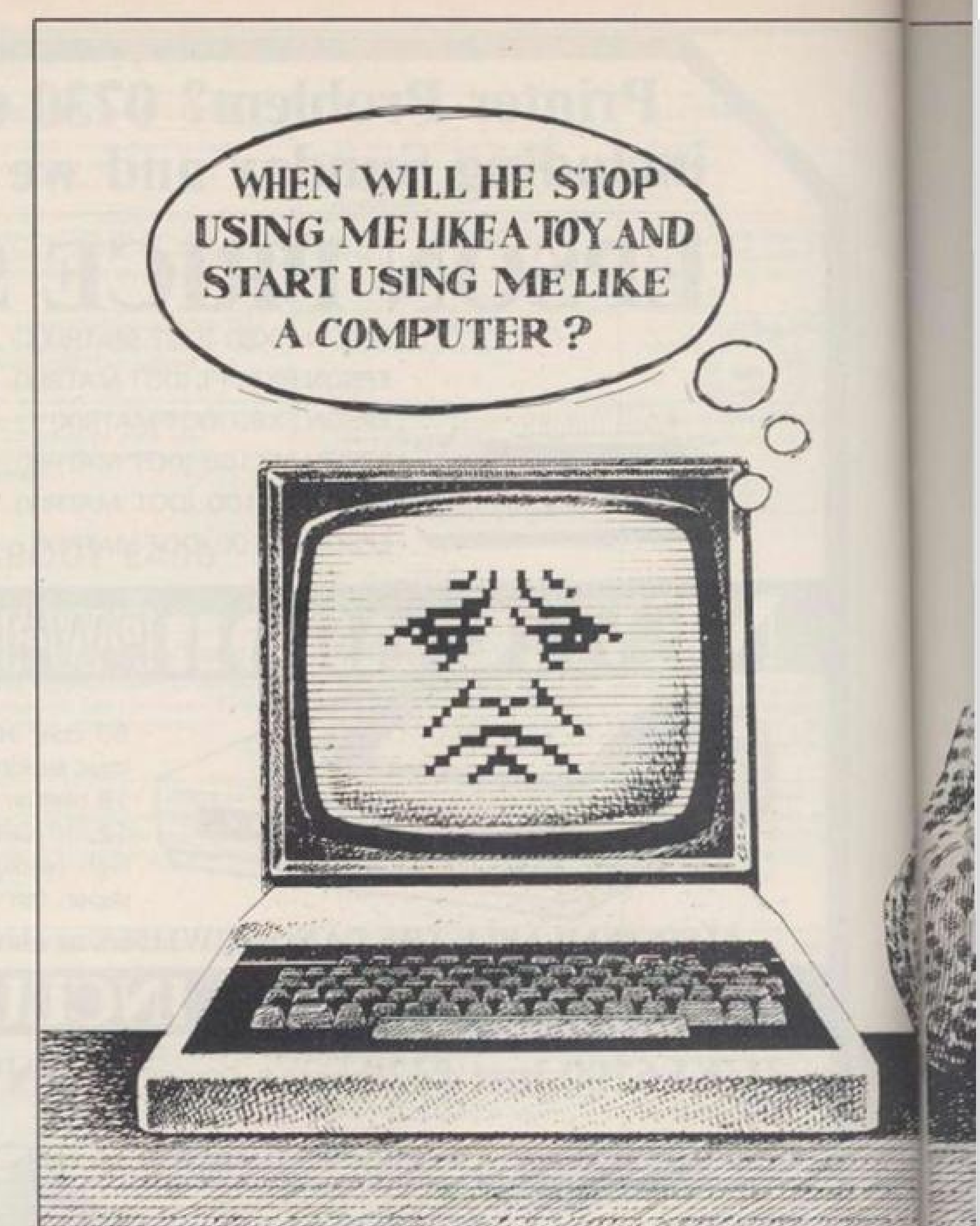
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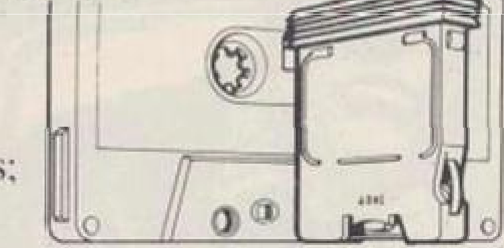
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PIRACY

Video companies have already felt the power of the pirates. Meirion Jones finds out how computer companies are trying to combat them.



NOT SINCE Johnny Kidd had them *Shakin' all Over* nearly a quarter of a century ago have the pirates been such hot news. Everybody's doing it from the market traders selling bottles of dubious yellow coloured water under the misspelt names of famous French perfumes to the upmarket jewellers selling bogus Cartier watches faked in Mexico.

As Terri Anderson of the British Phonographic Industry which has led the campaign against audio cassette counterfeiters explains "the whole business of intellectual theft is getting out of hand — there can hardly be a consumer product that you can't buy a pirated version of — shoes, jeans, records, software . . ." Even some software house heads admit to the temptation. "If you could photocopy cars" says David Potter of Psion — the company that has sold over 500,000 Flight Simulator programs to Sinclair owners "we'd all have Ferraris."

All the problems that the computer industry now has with piracy — an unauthorised copy of a program is made every three seconds — were experienced first in the audio and video industries. "Two years ago" as Peter Duffy, Director of Investigation of the film business's Federation against Copyright Theft says "every feature film that was released was pirated that week or before it came out".

The worst case was ET which was seen in millions of British homes, months before it was even premiered in this country. Unlike British software houses which originally concentrated their wrath on schoolkids making occasional copies to swop with friends, FACT went for the big boys. In alliance with BPI which was cracking down on audio copying they helped force through the 1983 amendment to the Copyright Act which Duffy says "totally transformed the position".

Raids on counterfeiters put many of them out of business with £2,000 fines and two year prison sentences as a deterrent. Projectionists hurrying out of the cinemas late at night as the last strains of God Save the Queen died away were ambushed by police before they could make an undetected overnight copy for the video pirates.

Audio tape counterfeiters were also hit hard by BPI raids although it is still waging a "Home-taping is killing music" campaign against casual copiers and demanding a levy on blank tape to reduce the margin between buying an album on cassette and taping it from a friend. But as the 1983 law has made it more difficult for the counterfeiters to make a dishonest living out of audio and video so they have moved into computer piracy where as Quicksilva director Rod Cousens points out "the law is a grey area".

Now that organised crime is moving in to computer game piracy the big software houses are taking a less hostile attitude to schoolkids who make a one-off swop for a friend. "Help us smash the counterfeiters and we won't send the police in on search and destroy missions to the home of every Spectrum owner" is the message.

The Federation against Software Theft — FAST — has been set up by the likes of IBM, Acornsoft, Sinclair, Microsoft, WHSmith, Thorn EMI and Virgin to get the same legal protection for software that already exists for records and videos. Nicholas Lyell the Member of Parliament for Mid Bedfordshire signalled the new initiative with a Ten Minute Bill in July which increases the chances that one day it will be made law.

He told Parliament "The video pirates who used to make pirated copies of video tapes and films, and whose activities are now being substantially curbed by the Copyright Amendment Act 1983 are now turning their attention to the piracy of software." He pointed out that "At least one operator has his own factory with sophisticated duplicating equipment and a substantial distribution network." He also explained the new realistic mood of the software houses "We are not after the schoolboy, but we are after the commercial pirates."

Industry figures like Quicksilva's Rod Cousens now see making copies for swaps as "an occupational hazard" which needs to be stopped by "technological advances" such as the speed loaders which make audio copying more difficult, and increased use of discs and cartridges. Anyone copying "for commercial gain" will feel the full force. Quicksilva was one of a dozen companies which backed August's Artic co-ordinated raids in Hull on small-time operations advertising their products in local papers.

Zap clubs too are on the target list of the companies. "They should be hit" says Mike Dixon of Frontrunner software — part of the K-tel group. Schools are blamed by many companies for not setting a good example. "Teachers are the worst offenders" according to Ranald Robertson of FAST. He blames this piracy "in the educaiton field as one of the main reasons for the lack of good educational software". Companies are unwilling to invest in development if they are going to sell insufficient units to cover the cost. That's why Ranald says "in the short term the user may gain but in the long term he will lose out."

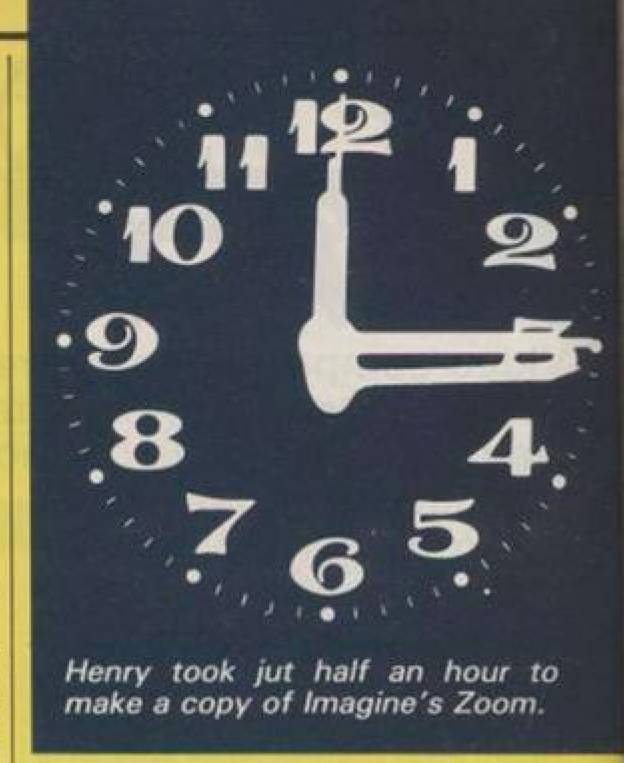
The new conciliatory mood of software houses to their customers — instead of regarding them as the enemy seems to be paying off. Quicksilva has been surprised how many of the members of its Gamelords club have volunteered information to their Super Pirates Squad — which has helped to squeeze out some of the counterfeiters.

PIRATE HOTLINE

We want to know if anyone near you is selling counterfeited computer games. We are not interested in Johnny next door who has made one copy of an outdated game but in people who are making money by stealing other people's work. You can often tell pirated tapes by their lack of identifying marks on the cassettes — for instance the butterfly mark on Quicksilva products. Phone *Your Computer* Pirate Hotline on (01) 661 3465 and we will treat any information you give us in confidence.

BREAKING AND ENTERING

Confessions of a pirate. Our old friend Henry Morgan reveals the tricks of the zapper's trade, smashing the protection that hides program secrets.



Henry took jut half an hour to make a copy of Imagine's Zoom.

HACKERS OFTEN derive as much pleasure from defeating a company's protection mechanisms then breaking into the program, altering it to taste and making a back-up copy as they do from actually playing the thing, more so in some cases. This article specifically looks at some of the protection mechanisms applicable to the Sinclair Spectrum, but the principles and the moral of the story apply equally to all home computers.

Way back in 1982, when the first commercial games were marketed for the Spectrum, very few authors bothered to protect their programs. It seems that software piracy had not been heard of. These early programs offered no challenge to those who wished to copy them, all that was necessary was to have sufficient knowledge to read a program "header". This is the very short burst of 17 bytes which follow the first "tone" when a program block is loaded into a Spectrum, and comprises the information which the computer needs to know about that block; that is whether it is in basic or machine code, which part of memory it is to be loaded into, how much there is of it, does it auto-run and so on.

It is very easy to isolate and read headers, and so no Spectrum program can ever be made absolutely secure. Most software loads in two or more sections, all that was needed to copy a program back in those days was to Break into the Basic block, save it with the appropriate line to make it auto-run then load the code block and save it defining the start and length, all this information is available in the headers.

Of course it wasn't long before software houses realises that their work was all too easy to rip-off, and so a number of ingenious mechanisms began to appear to stop the home user from being able to break into the software.



Two simple mechanisms which soon appeared were the DF-SZ and the ERR-SP. I will explain what these are. If you read the Spectrum manual, you will find a section on the "system variables".

System variables, also known as run-time variables, are numbers held in a special part of the computer's memory whose only purpose is to allow it to know what it is doing and what is going on inside it. DF-SZ is a good example of a system variable, it lets the Spectrum know how many lines are to be reserved in the lower portion of the screen for reports. Normally there are two lines, and so DF-SZ holds the value 2. DF-SZ can be altered by POKEing a different value into 23659, which is its address in the system variables area. If its value is changed to 0, then there will be no spare lines available for the reports such as Break to be written, and the computer crashes if one is encountered. So you cannot just break into the program.

ERR-SP is a little more complicated in that it occupies two locations, 23613 and 23614. It points to an address in memory where an instruction is waiting to be performed if a report such as Break or Stop needs to be produced. It is very easy to point this variable to a part of memory which causes spectacular crashes if the program is broken into, simply by fiddling with the values using the Poke command. These two mechanisms will stop anyone from successfully breaking into a Basic program, but the Spectrum has a simple device to defeat them.

A Basic program can be Merged instead of Loaded, and instead of auto-running just sits there waiting for a hacker to list it! Clearly DF-SZ and ERR-SP were inadequate on their own as real protection.

As you know, blocks of machine code are normally loaded in and then run by short Basic programs which precede them, using a Usr command. Since it is so easy to disable any protection present in the Basic block, software houses had to look for methods of protecting the code itself.

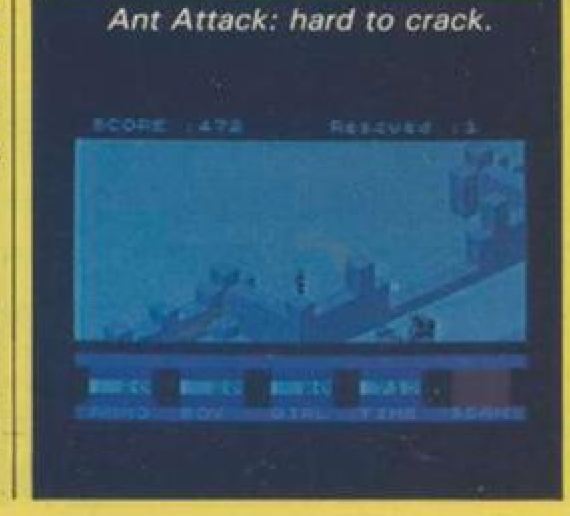
Load in short bursts

Some programs can be found which load in very short bursts of bytes after the main block of machine code has been loaded, these serve to protect the main block which will crash if they are not present. Often they are mini programs themselves which modify the code in some way, either by providing data or by altering its position in memory. A determined copier will use his knowledge of header reading to simply load each section in and then save them sequentially, but wait . . . the copy crashes when run.

This is usually because of another system variable, Frames. This is actually a clock, it is incremented 50 times per second and the value is therefore constantly changing. Frames occupies three locations, although only one is usually checked by the protection mechanism. How does it work? A short block of three bytes is loaded into Frames, which will immediately begin updating the values. A short time later, one of the first set of instructions in the code block will compare this value with a pre-determined value held somewhere, it doesn't matter where, in memory.

If the result is not what it should be, that is if it was a copy then the program will direct the computer to do a system reset. This is not a difficult mechanism to disable, indeed there are several methods which hackers can and undoubtedly do use. Those with no knowledge of machine code will normally alter the Basic loader so that the block is loaded into Frames irrespective of where it was saved from. A more elegant approach is to disassemble the offending section of code and nullify it.

So, we see that the headers preceding blocks of code give the game away every time. It wasn't long before programs came on the market featuring sections of code which



Ant Attack: hard to crack.



PIRACY

loaded in without headers. To demonstrate how this works, it is necessary that you understand a little machine code, but do not worry, I shall explain all. The Spectrum Rom is actually a machine-code program that carries out all the Basic commands, including those involved in loading and saving software. Indeed, a large chunk of Rom is devoted to these procedures.

Save a block

It is quite possible to save a block of memory and it doesn't matter whether its Basic or code or whatever without a header, as long as the microprocessor, the computer's brain, is first told some basic facts about what you are doing. This has to be done in machine code, since there are no Basic commands that will do the job. The microprocessor — in the Spectrum its a Z80A — can be thought of as a chest of drawers, with the drawers in two rows, and given letters, A B C D E etc. These drawers are actually called registers, and registers next to each other can be paired if necessary, eg BC, DE. On its own a register can hold a number from 0-255, but a pair can hold 0-65535.

For a block to be saved without a header, the A register is loaded with the value 255, the IX register is given a number corresponding to the start of the block, the DE register pair is told the length of the block and the Rom save routine is called at location hex04C2, which by-passes the header mechanism.

Such headerless sections are themselves loaded in not by a Basic loader, but by a block of code.

The instructions which do so are extremely simple, again the A register is given the value 255, the IX register to a position of memory where the program is to go to and the DE register pair the length. Also, the Carry flag must be set, the F or Flag register is a sort of microprocessor system variables, Carry being one of the variables, that is, given a value of "1", and the Rom routine called at hex 0556.

The headerless system is ingenious, but it still relies upon a section of code which must be loaded in the normal way, and this is vulnerable to anyone with a disassembler. An increasingly popular trick is to load in a block of code, often without a Basic loader, which apparently auto-runs itself. This is a very simple technique, but it can be very effective if combined with headerless sections. How does a block of code autorun? As you might expect, it is due to our friends the system variables. You now know that these are continually updated by the computer and in effect at any one moment in time hold a complete record of the state of the computers memory.

If a block of code is saved so as to include the system variables the Basic program area and also the machine stack, a few bytes found just below Ramtop, it will run when loaded back in from where it left of — code blocks which autorun include a USR command just after the save. For instance:

```
10 SAVE "NAME" CODE 23552, 4000
20 RAND USR 27000
```

where 23552 is the start of the system variable.

Copying a program saved in such a fashion is actually quite simple, and so it is really no deterrent to the hackers. If the program is not too long, a budding pirate could simply clear Ramtop to a suitably low address load the code above it and save from there.

When you want to play the thing, you merely load it back to the original address.

If the program length is too long to allow Ramtop to be covered to a sensible level, the pirate merely needs to generate an error report — but how? Quite simply, he or she loads the block in using either a machine coded loader, as previously described, with a length specification set too high. On encountering insufficient bytes on the tape the computer would be put back into Basic, allowing the hacker to continue from there. Easy isn't it?



But you say, what if DF52 or ERR-SP had been previously set? If you remember, the save routine produces a report in the lower screen when actuated, and so no auto-run code block can have these mechanisms. Unless it is a headerless block!

What does one do if the program block occupies the full length of Ram from 16384 the start off screen Ram to 65535 P-Ramtop. Again machine code is resorted to, but this time a short program is written from within system variables to load the program as a headerless block from 16384 to 65535 but excluding those bytes occupied by the loader. Such programs, complete with headerless files are no longer rare.

All the mechanisms that I have described, and one or two I still have up my sleeve, cannot stop a potential pirate from connecting up two cassette recorders and simply dubbing the programs. What they do however is make life awkward for the hacker. It does nothing to stop the large scale criminal pirates who are the ones that actually defraud the companies of their money by copying tape to tape. I do not believe that schoolkids or hackers defraud the companies of much revenue, simply because I am sure they probably spend all their available pocket money on games anyway, and even if they do pirate a few copies, in most cases simply because they've already spent their money.

The cake is only so big. Is there a system then that is fair to the hacker that actually buys the tapes, but makes life awkward for the large-scale pirates? There is. Owners of Jet Set Willy by Software Projects, or Night Gunner by Digital Integration will have noticed a protection mechanism requiring the input of a code before the game could be played — once again it is easy to nullify such a mechanism but the long scale copiers who actually need to mimic both the game and cassette inserts need to go to extra trouble — perhaps they won't bother. Mathew Smith with his Jet Set Willy could have made life difficult for the hackers with headerless files and so on, but chose not too — and witness the result.

Immense interest was generated in his game leading to all manner of Pokes being published in many computer magazines, which I am sure generated more sales revenue in turn — free advertising. In conclusion then, what is the hackers view?

The hacker probably likes a bit of a challenge, but no unfriendly 48K headerless autorun code blocks. He likes to dable around in the code, and may perhaps make a back up copy or two. How much does this defraud the software company? Not much. The only mechanisms so far which actually inhibits the large scale tape pirates is the colour code as seen in Jet Set Willy — and this is no obstacle for the hacker. So, 10 out of 10 for Mathew Smith and his fertile mind, I will certainly be looking out for his next offerings.

IMAGINE: WHAT WAS THE NAME OF THE GAME?

In 18 months Imagine shot from nowhere to the top and back again. Many blamed piracy for the collapse. Imagine's operations director Bruce Everiss disagrees . . .

THE POPULAR MISCONCEPTION of Merseyside is of a riotous Toxteth backing onto strike-bound docks. People see it as a fluke that the area has been the centre for pop music for the last 20 years. Now Liverpool's emergence as a leading force in the micro industry seems somewhat surreal.

The reality is that Merseyside has a fair share of the electronics industry with major companies such as Plessey and Marconi. The area also has an unfair share of traditional data processing with lots of big installations such as the National Giro, Royal Insurance, Littlewoods, the Ministry of Defence, BICC and Unilever. A further factor is the excellent reputation of the computer departments at Liverpool University and Liverpool Polytechnic and also the private sector training of computer staff at KBS.

Against this background it is not surprising that one of the first computer stores in Britain was set up in Liverpool and traded successfully in 1978. Microdigital's customers set up some of the earliest and most enthusiastic computer clubs in the country. Microdigital's staff often left to set up or work for new microcomputer firms, spawning an industry. Two well-known ex-Microdigital staff are Eugene Evans and Mark Butler. Microdigital was absorbed by Laskys in 1980 which resulted in yet more staff leaving to work elsewhere.

Among the Liverpool companies was one of the first games software houses, Bug-Byte, owned by Tony Baden and Tony Milner. Then, as now, the two Tonys ran their business cautiously, preferring safe gradual growth. Two staff at Bug-Byte, Mark Butler the sales manager and David Lawson a programmer, did not agree with this policy and sought a more aggressive approach.

Both were offered, and turned down, a share in the ownership of Bug-Byte. Due to the clash of personalities David Lawson was given notice in late 1982 followed by Mark Butler who left of his own volition. They formed Imagine Software.

Knocked on doors

David wrote a superb Galaxians/Invaders-type shoot-'em-up game, Arcadia, for the Vic-20 and Spectrum. Mark Butler knocked on doors and sold it. There was a shortage of software in the shops at Christmas 1982 which Imagine met by doing deals with duplicators and by trucking software all over the country. Arcadia went to number one and stayed there. Imagine invested the proceeds of its success in advertising and started a high-profile image that was to remain.

The economics of games software is like high-stakes gambling. To launch a game properly costs anything from £10,000 upwards and if it fails all is lost. If it succeeds it is a licence to print money as the manufacturing cost is so low compared to the retail price. Through 1983 all Imagine releases succeeded and thus Imagine became the undisputed number one games software house.



David and Mark found themselves in a situation that they were not equipped to cope with, catapulted from obscurity to fame and fortune in a few short months. Realising this they sought advisors, both professional and management. This advice, by and large, made Imagine more successful still. Eventually, however, by taking wrong advice and ignoring sound council, decisions were made that led to the downfall of Imagine.

Mistake number one was that Mark and David believed that Imagine's success proved them to be good businessmen and that they could thus apply their talents to other businesses. Against advice they tried to run an advertising agency, Studio Sting, along with Steven Blower. They gave Steven 10 per cent of Imagine and in return each owned a third of Studio Sting. Studio Sting failed. The reasons behind the failure are many but include the following: First, the relationship between the two companies was never defined and areas of responsibility were never laid down; second, there was insufficient management resources to have any control over events or to institute systems; third, when things started going wrong the relationship between Steven and his co-owners broke down.

Mistake number two was not employing a professional accountant until just before the end, again against advice. This meant that there was insufficient financial control. It was not possible to discover whether anything was profitable or not. Money was spent without knowing whether it could be afforded. Funds were not available when they were most needed. Incoming invoices were paid without being checked.

In the beginning none of this mattered because there was no much profit to finance them — hence the downfall. The wages bill was over £50,000 a month, not because of high wages but because of the large number of employees.

The rents and rates bills were enormous because of the insistence on prestige and because of moving twice to bigger premises while still paying for the premises vacated. Comparatively little was spent on advertising.

Mistake number three was the refusal to manage technical staff. David Lawson insisted that programmers, artists and musicians were special and that any attempts of management would reduce productivity, obviously the reverse is true. While the administrative, sales marketing, accounts and warehouse staff were well managed and earned their salaries the technical staff could do as they pleased. This was excused on the basis that they worked at home or because discipline would reduce creativity. The reality was that it took over 50 technical staff to produce Imagine's products, usually late and usually with bugs still in them.

Mistake number four was to be taken in by their own publicity instead of reality. This is an obvious human failing but one which they were warned to guard against, especially as the publicity seemed to create a largely false picture. An example is to take a



Operations director Bruce Everiss: "The economics of games software is like high-stakes gambling."

programmer and make him famous; after that no matter how good he is at his job he is held in esteem because of his publicity.

Mistake number five was the Marshall Cavendish project to produce 26 games across five machines — this was worth as much as £11 million to Imagine over two years. The first problem was not to give these games sufficient priority, thus losing the contract. The second problem was keeping on the staff and therefore the overheads after losing the contract.

Mistake number six was the Megagames. After six months work and at a cost of several hundred thousand pounds the games were nowhere near completion. It was obvious that Imagine could not afford the cost of writing them never mind the cost of mass-producing the special hardware necessary. Despite this Imagine's best resources were committed at the expense of producing any good "ordinary" games to pay to keep the company going.

Internal politics

Mistake number seven was allowing internal politics to flourish. The tougher things became the worse were the politics with certain people looking after their own naked ambition at the expense of the company. Certain wives were allowed to interfere at will with the running of the company. It became difficult for staff to identify the motives behind actions.

Despite the meteoric rise and fall of Imagine, some good things have come out of it. Imagine created the market as we now know it. By deliberately having a high profile and with the use of hype, especially in the national daily press, the games software industry was born. Prior to Imagine the industry was small and fragmented with its products appealing to a small specialist audience. Imagine popularised the industry and created a switch in consumer spend. The industry has gone from mail order to high street multiples.

Imagine led with product quality. Look at a few pre-Imagine games and be amazed at their crudity. Imagine set standards in playability, originality and use of graphics and sound that were quickly imitated by the whole industry. When Ultimate got ahead in graphics quality Imagine responded by employing professional artists to produce the bit patterns.

Imagine was departmentalised with clearly defined areas of responsibility and a well-developed management reporting system. The rest of the industry has largely followed suit.

Imagine showed the way with marketing software as a mass consumer product: Good PR is essential these days — Imagine was the first. Every new advertising idea was subsequently copied as were the insert cards.

Imagine had the first professional sales team with a sales manager, telesales and export telesales, sales and market research and an export manager. For the first six months turnover at least doubled each month. Eventually, well over half all sales were from export.

Imagine was developing a new type of product that was enjoyable as a game but which educated the player. The first such product, Sidney Meets His Match, was completed but never marketed.

Imagine was starting with the use of professional psychologists to look at game playing *per se.* By looking at the motivation the hope was to produce more playable, more addictive games.

Imagine's contribution

Imagine was looking at alternative input devices including electrodes to monitor brain waves and thus allow thought control of games.

The best thing to come out of Imagine is not yet obvious. Time will surely show that those people who worked at Imagine have a lot more to contribute to the microcomputer industry. Already, there are former staff working for Ocean, Bug-Byte and Software Projects using knowledge and skills gained while at Imagine. Many former staff have now formed their own companies doing what they did at Imagine but reaping the rewards for themselves.

Already, there are at least five new companies on Merseyside composed of these people. It is too early for any of them to have made their mark but there is little doubt that they will. A small flock of Phoenix rising from the ashes of Imagine.



NEWS

...the name of the game

Issue 1 March 1984

IMAGINE – A SOFTWARE SUCCESS STORY

A year after its formation in the front room of a Merseyside house, Imagine Software Limited has mushroomed into the world's largest independent company in the fast-moving world of home ... games.

... partnership bet-

a £35,000 a year earning potential after Imagine's launch of his 'Wacky Waiters' for the VIC.

Other 'top ten' games have followed in quick succession. There have been 'cuties' like 'Ah Diddums' and 'Molar Maul' for the Spectrum, arcade-style blasters such as 'Zzoom' and 'Zip Zap' for the Spectrum, and the occasional outstanding game bought-in from ... programmers, such as 'Jump- ... Spectrum (now re- ... Atari) and

were among the first to use the ... processing power of the Apple ... aid to rapid program development ... this has now been superceded ... use of Sage 'super-micros' wi... disk storage and the ability to ... line and simplify highly ... machine code routines.

Imagine also employ their ... time professional artists and ... to work with programmers ... ing the visual and aural ... new games.

For the future, Imagine ...

Program 1.

```
100 REM PROGRAM ONE : (C) AM CAPLE 1984
170 POKE53280,6:POKE53281,6:PRINT"■■■■■■            GENERATING CODE"
180 PRINT"■             PLEASE WAIT■■■■■"
185 PRINT"■DONE ■0";TAB(17);"■LINES";TAB(31);"■TO DO ■178        ■"
190 LN=10000:ER=0:AD=49152
200 F=0:READA$:IFA$="END"THENPRINT"CODE OK":END
210 IFLEN(A$)<>24THENPRINT" WRONG NUMBER OF DIGITS";:GOTO800
220 T=0:L=4:GOSUB900:IFERTHEN800
230 IFAD<>DTHENPRINT" BAD ADDRESS";:GOTO800
240 L=2:N=0
250 GOSUB900:IFERTHEN800
260 POKEAD+N,D:N=N+1:IFN<8THEN250
270 TL=T:L=4:GOSUB900:IFERTHEN800
280 IFTL<>DTHENPRINT" CHECK SUM";:GOTO800
290 LN=LN+10:AD=AD+8:K=LN/10-1000
300 PRINT"■■■";TAB(4);K;" ";TAB(36);178-K;"■   ■":GOTO200
800 PRINT" ERROR":PRINT"■ ";MID$(STR$(LN),2);" DATA":A$
810 PRINTTAB(F+10);"↑":PRINT"■"
820 POKE53280,2:POKE53280,4:GOTO820
900 C=L:D=0:FORG=1TOL:F=F+1:D$=MID$(A$,F,1)
910 IFD$<"0"ORD$>"F"OR(D$>"9"ANDD$<"A")THENPRINT" ILLEGAL DIGIT";:ER=-1:RETURN
920 Q=ASC(D$)-48+7*(D$>"9"):T=T+Q:D=16*D+Q:NEXT:RETURN
10000 DATAC00078AD0DDCA9008D0F008F
10010 DATAC008DCAE06DCAC07DCA900AD
10020 DATAC01059 8D0FDCAD20D049008B
10030 DATAC01801 8D20D0C8D008E00071
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10110 DATAC058D02AA48FA908858F0096
10120 DATAC060A58B49FFA629F0070090
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10140 DATAC070FBA6FBE4FDD006A500A7
10150 DATAC078FCC5FEF0B0E886FB00BC
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10170 DATAC08868584 0A58E309CE6008C
10180 DATAC09026D0F1E6274C84C0007F
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10210 DATAC0A82AA9038D20D0A9000077
10220 DATAC0B0858E8526852785020074
10230 DATAC0B8A908858FA97F8D0D00A9
10240 DATAC0C0DC8D0DDDA9008D0E00A3
10250 DATAC0C8DC8D0FDCA9008D0500A3
10260 DATAC0D0DCA9108D04DCA9FF00A9
10270 DATAC0D88D07DC8D06DCAD1400A6
10280 DATAC0E0038D9F02AD15038D0081
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10300 DATAC0F0C08D1503A50129DF007C
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10340 DATAC110DC30F7A91E859EC60098
10350 DATAC1180278A9008D0EDC8D008B
10360 DATAC1200FDCA97F8D0DDCA900AE
10370 DATAC12810D0DDC203EC558008C
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10390 DATAC138A5BAC901F005A5930081
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10450 DATAC16805204FC4B006A90B0074
10460 DATAC170384C39C2A58B85C10085
10470 DATAC178A58C85C2A5B929FE00A5
10480 DATAC18085B9A93C85FBA9500097
10490 DATAC18885FDA90385FC85FE00AE
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10520 DATAC1A030C2A063202FF1A00068
10530 DATAC1A800B94103 20D2FFC8007E
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10960 DATAC300A200A9028D20D0AD006B
10970 DATAC3080EDC09018D0EDC580091
10980 DATAC310A9005 02A502F0FC006D
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11030 DATAC338A000A2000 69B6602A0 69
11040 DATAC340A2014A9001E88E8C0070
11050 DATAC348A602F0FC88D0EFA6009D
11060 DATAC350FBE4FDD006A5FCC500AA
11070 DATAC358FEF00AE886FBD0CA00B3
11080 DATAC360E6FC4C2AC3A9008500 8F
11090 DATAC36802A502F0FC78A900007C
11100 DATAC3708D0EDC203EC520DA008F
11110 DATAC378C4586085FBA5BAC900A1
11120 DATAC38001F005A5FB4CEDF50094
11130 DATAC388AD20D0852AA90085007E
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11160 DATAC3A0A5C28D3E03A5B929008D
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11200 DATAC3C09941034CB1C38402006E
11210 DATAC3C82077C4B01EA58B8D0094
11220 DATAC3D03D03A58C8D3E038800 8B
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11740 DATAC570A90085FBA9C085FC0099
11750 DATAC578A28FA0C5A9FB20D800A2
11760 DATAC580FF1860564 64C20430074
11770 DATAC5884F444520312E3000005E
11780 DATAEND
```



Printers beware!

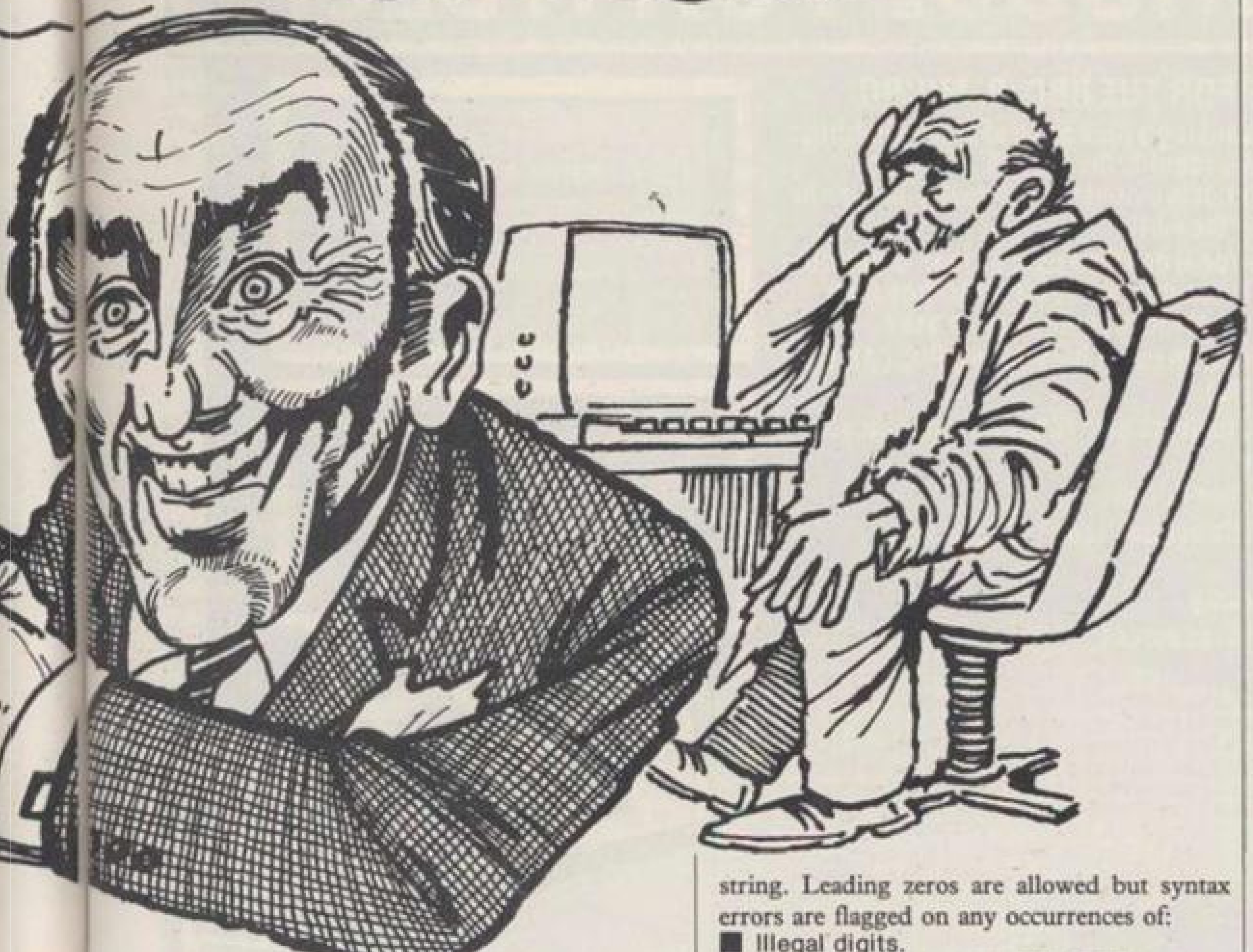
Andrew Capel's speed loader also makes programs tough to crack for audio-copiers.

VFL IS AN alternative Datassette communications program for the CBM-64. Not only does VFL improve on speed and reliability but on versatility as well. It runs in approximately 1.5K bytes, and fluctuates between 1,500 and 3,000 baud giving an average of roughly 2,200 baud for an evenly distributed file.

Here is a list of VFL's features:

- Communicates up to 9.5 times faster than the normal kernel routines.
- Runs directly from Basic replacing the original CBM V2 Load, Save and Verify commands.
- Code may be saved without resorting to machine code.
- Code may be force-loaded to any specified location.
- Invisible loading facility, preserving the variable pointers.
- Full error reports.
- Occupies no Basic program area.
- May be called in machine code using the standard kernel routine addresses and formats.
- Visual and audio task completion signals.

CBM-64 QUICK LOADER



- Full motor control.
- Retains video output.

To link the new routines to the operating system the system vectors ILoad and ISave must be altered. A small program within VFL changes these vectors and may be called by:

SYS 50473

Once ILoad and ISave have been changed Basic will call on VFL until:

- Obviously power down.
- A system restore is called.
- A 6510 BRK instruction is executed.

In cases two and three the system call above will rechain VFL. Case one poses much more of a problem.

SAVE
SYNTAX:
SAVE [<FILE-NAME STRING>],
[<DEVICE NUMBER>],
[<SECONDARY ADDRESS NUMBER>]
DEFAULT : NULL STRING,1,0

Only the first 16 characters of the file-name are saved on the header. Names shorter than the limit are padded with trailing spaces. When a colon is included anywhere in the file-name string it will signal the end of the file-name and the presence of two numeric parameters. These two numbers represent the addresses of the first and last bytes sent to the Datassette.

They should be written in hexadecimal, prefixed by a dollar sign and separated by a dash. Spaces are permitted between the colon and the first dollar sign, the last digit of the first number and the dash, the dash and the second dollar sign and between the last digit of the second number and the end of the file-name string. Leading zeros are allowed but syntax errors are flagged on any occurrences of:

- Illegal digits.
- Numbers not in range $0-$FFFF.
- Second number is less than the first.
- Any character other than a space between the colon and first number, first number and dash etc.

The secondary address number:
Bit 0 = 0 code relocatable on load
Bit 0 = 1 code may not be relocated and is always loaded back at the address from which it was saved.

Once your command has been accepted the usual motor tests are performed, which may result in a prompt. When the appropriate keys are closed VFL pauses for a second to allow the Datassette to reach operating speed. While the header tone is being sent the border displays static, red and cyan bars. When data is being transmitted the bars are more active, are narrower, and change to light grey and light blue. When all the data has been despatched a tone will sound and the motor is stopped. An example is:

SAVE"FRED:$8000-$8000",1,1

This saves one byte from address 32768 with a file-name of Fred (+ 12 spaces) and protects it from force-loading.

LOAD/VERIFY
SYNTAX:
LOAD [<FILE-NAME STRING>],
[<DEVICE NUMBER>],
[<SECONDARY ADDRESS NUMBER>]
DEFAULT : NULL STRING,1,0

The file-names on the cassette are only compared as far as the length of the file-name in memory up to a maximum of 16 characters. Any characters over this limit will be ignored but no error will be generated. If a program is saved by typing:

SAVE"HERBIDATIOUS"

it may be loaded by typing:

LOAD"HERBI"

Again a colon is significant, but in this case only one number is expected by the syntax.

(continued on page 81)

The preloader.

```
10 REM* PRELOADER : (C) AM. CAPLE 1984
20 P=PEEK(2054):IFP=43THEN80
30 POKE2054,P+1:POKE53280,6:POKE53281,6
40 PRINT"[control characters]VFL IS LOADING"
50 FORF=1TO2000:NEXT:PRINT"[control characters]"
60 POKE56,207:POKE52,207
70 LOAD"",1,1
80 PRINT"[control characters]VFL HAS LOADED[control characters]";:SYS50473
90 POKE56,160:POKE52,160:NEW
```

(continued from page 79)

This follows the format as described in the Save instructions and will give errors for the same reasons. Its value represents the address of the memory location where the first byte of the saved file will be stored. Enclosing a force load will automatically over-ride Bit 0 of the load secondary address number but will be over-ridden by Bit 0 of the save secondary address number.

The secondary address number:

- Bit 0 = 0 Code loaded to the address supplied by the force load. Defaults to $0801.
- Bit 0 = 1 Code loaded to the address from which it was saved. NB. This bit is over-ridden by a force-load value.
- Bit 1 = 0 The variable pointers are redefined according to the address of the last memory location altered by the load command.
- Bit 1 = 1 The variable pointers are restored to their values prior to the load command. NB. Basic load destroys all present variables.

Once VFL finds a header file the file-name and addresses of first and last bytes of save are displayed on the screen. These values are derived from the header information and may not be the addresses of the code's destination.

When VFL is searching for the correct file the border displays red and cyan bands. Once the information is being read the border flickers light grey and light blue. To stop the CBM/Run Stop key combination resulting in an immediate break error, follow these steps:

- Hold the CBM key down.
- Press the Run/Stop key.
- Release the Run/Stop key.
- Release the CBM key.

On completion of Load, Save or Verify commands a tone on oscillator one will be triggered. To achieve this VFL sets the pulse width registers, the frequency value and the ADSR controls. VFL then gates the pulse waveform producing a ping sound, however the master volume control is not affected. To make this tone audible the MVC must be set to some non-zero value.

To make a copy of VFL these instructions must be followed carefully. First key in the preloader program and program 1 then save them on two separate cassettes. It is important that the listings are followed to the letter, as line numbers and Rem statements are important. Also the preloader program must not be Run before it is Saved on tape.

Now try Running program 1.

Each line contains enough information to generate eight bytes of object code. The first four hex digits give the address of where the first of the eight will be stored. Next follow eight pairs of digits giving the values of each of the eight bytes. Finally another four-digit number gives a check sum relating to values of the first 20 characters in the data line. If an error is generated, correct the offending line then resave, verify and rerun the program. When a code OK report is flagged resave the program just to make sure. Now type New and load in the preloader. Without rewinding the tape type:

SYS 50522

and press play and record on the datassette. This saves a copy of the object code. Now rewind the tape and engage the auto load/run sequence. The preloader should load in the object code, chain VFL to basic and clear itself. If Save, Load or Verify errors persist check program 1, correct it, and repeat the code saving procedure.

Program 2 may be used to disassemble the object code. If you use this routine to debug the code file, note that there should be no invalid op-codes before the address 50568 decimal ($C588 hex).

Program 2.

```
10 REM PROGRAM TWO : (C) AM CAPLE 1984
20 POKE53280,6:POKE53281,6:PRINT"■";
100 DIMI$(56):FORF=0TO56:READI$(F):NEXT:DIMC$(15)
101 C$(0)="-4E5[4[4[4E2%2[4G4E0%3[4[4E1%1[4"
102 C$(1)=",:E6[4[4[4E7%7[404E9[4[4[4E8%8[4"
103 C$(2)="?1$5[4[4)2$2J2[4I4$0J3[4)1$1J1[4"
104 C$(3)="*:$6[4[4[4$7J7[404$9[4[4[4$8J8[4"
105 C$(4)="L4:5[4[4[4:2C2[4F4:0C3[4>1:1C1[4"
106 C$(5)=".::6[4[4[4:7C7[424:9[4[4[4:8C8[4"
107 C$(6)="M4#5[4[4[4#2K2[4H4#0K3[4>;#1K1[4"
108 C$(7)="/:#6[4[4[4#7K7[404#9[4[4[4#8K8[4"
109 C$(8)="[4R5[4[4T2R2S2[494[4X4[4T1R1S1[4"
110 C$(9)="&:R6[4[4T7R7S<[4Z4R9Y4[4[4R8[4[4"
111 C$(10)="B0@5A0[4B2@2A2[4V4@0U4[4B1@1A1[4"
112 C$(11)="':@6[4[4B7@7A<[434@9W4[4B8@8A9[4"
113 C$(12)="6045[4[4624272[4=44084[4614171[4"
114 C$(13)="+:46[4[4[44777[41449[4[4[44878[4"
115 C$(14)="50N5[4[452N2;2[4<4N0D4[451N1;1[4"
116 C$(15)="<:N6[4[4[4N7;7[4P4N9[4[4[4N8;8[4":DIMM(12):FORF=0TO12:READM(F):NEXT
200 PRINT"■■  *** DIS-ASSEMBLER (C) AMC 1984 ***■"
205 INPUT"■ START ADDRESS ................   49152■■■■■■■■";AD
210 INPUT"■ END ADDRESS ..................   50576■■■■■■■■";EN
220 INPUT"■ OUTPUT DEVICE NUMBER ........   3■■■■";DE
230 INPUT"■ SECONDARY ADDRESS ...........   0■■■■";SA:OPEN4,DE,SA
235 PRINT#4:PRINT#4," DISASSEMBLY OF";AD;"TO";EN:PRINT#4
250 D=AD:L=4:GOSUB8000:L=2:O$=" $"+D$+" : "
260 D=PEEK(AD):F$=MID$(C$(INT(D/16)),(DAND15)*2+1,2):MD=ASC(RIGHT$(F$,1))-48
270 GOSUB8000:O$=O$+D$:V$="":N=M(MD)
280 FORG=1TO2:IFN=0THENO$=O$+"   ":GOTO291
290 AD=AD+1:D=PEEK(AD):GOSUB8000:O$=O$+" "+D$:V$=D$+V$:N=N-1
291 NEXT:ONMD+1GOTO360,350,350,355,370,310,320,330,330,340,300,305,340
300 Q=PEEK(AD):D=AD+1+Q+(Q>127)*256:L=4:GOSUB8000:L=2:V$="$"+D$:GOTO370
305 V$="($"+V$+")":GOTO370
310 V$="($"+V$+",X)":GOTO370
320 V$="($"+V$+"),Y":GOTO370
330 V$="$"+V$+",X":GOTO370
340 V$="$"+V$+",Y":GOTO370
350 V$="$"+V$:GOTO370
355 V$="A":GOTO370
360 V$="#$"+V$
370 PRINT#4,O$;" : ";I$(ASC(F$)-35);" ";V$:IFAD<ENTHENAD=AD+1:GOTO250
380 PRINT#4:PRINT#4," OK FINISHED":PRINT#4:CLOSE4:END
8000 D$="":FORF=1TOL:D%=D/16:R=D-16*D%+48:D=D%:IFR>57THENR=R+7
8010 D$=CHR$(R)+D$:NEXT:RETURN
9000 DATAADC,AND,ASL,BCC,BCS,BEQ,BIT,BMI,BNE,BPL,BRK,BVC,BVS,CLC,CLD,CLI,CLV
9010 DATACMP,CPX,CPY,DEC,DEX,DEY,EOR,INC,INX,INY,JMP,JSR,LDA,LDX,LDY,LSR,NOP
9020 DATAORA,PHA,PHP,PLA,PLP,ROL,ROR,RTI,RTS,SBC,SEC,SED,SEI,STA,STX,STY,TAX
9030 DATATAY,TSX,TXA,TXS,TYA,???
9040 DATA1,2,1,0,0,1,1,1,2,2,1,2,1
```

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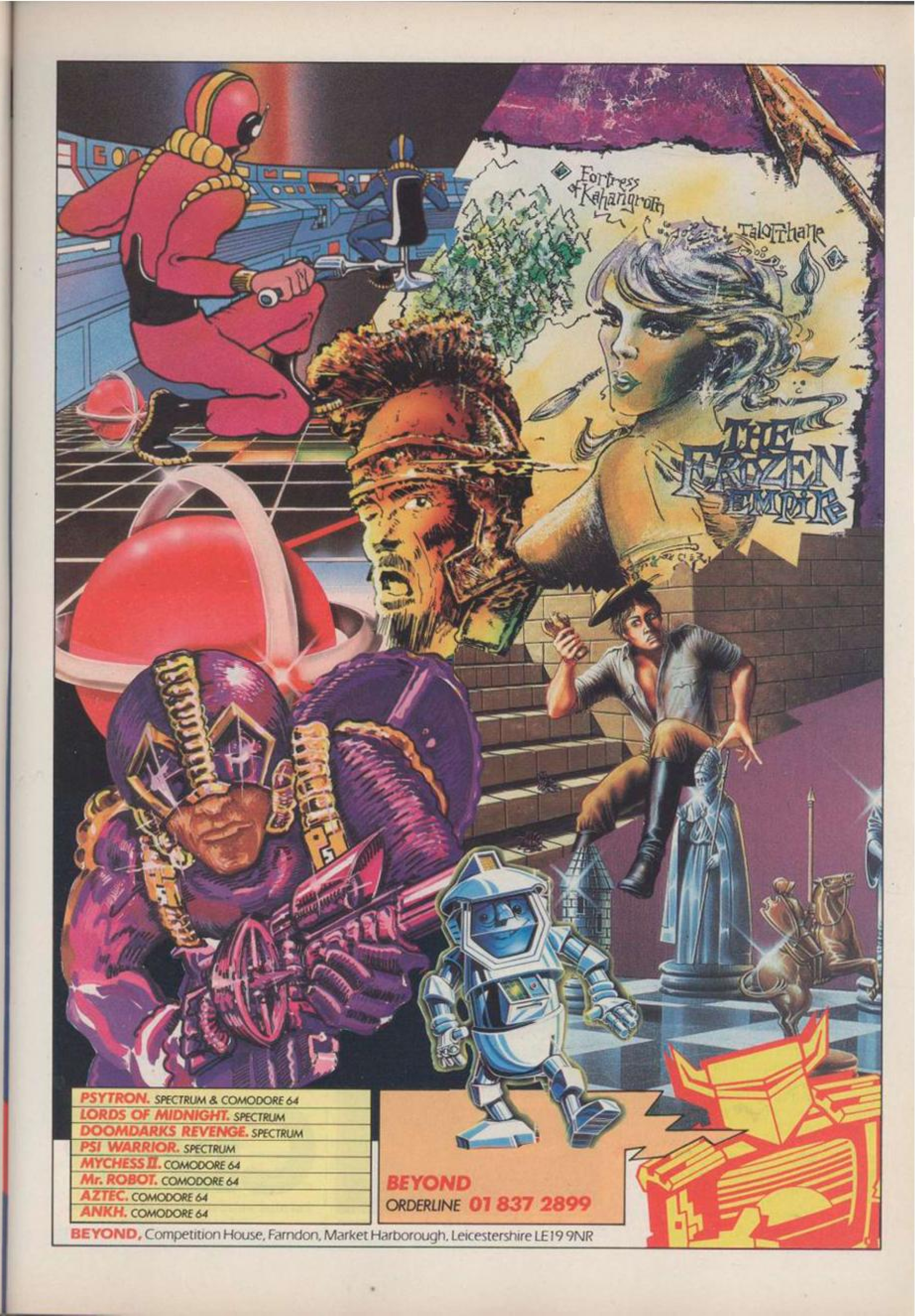
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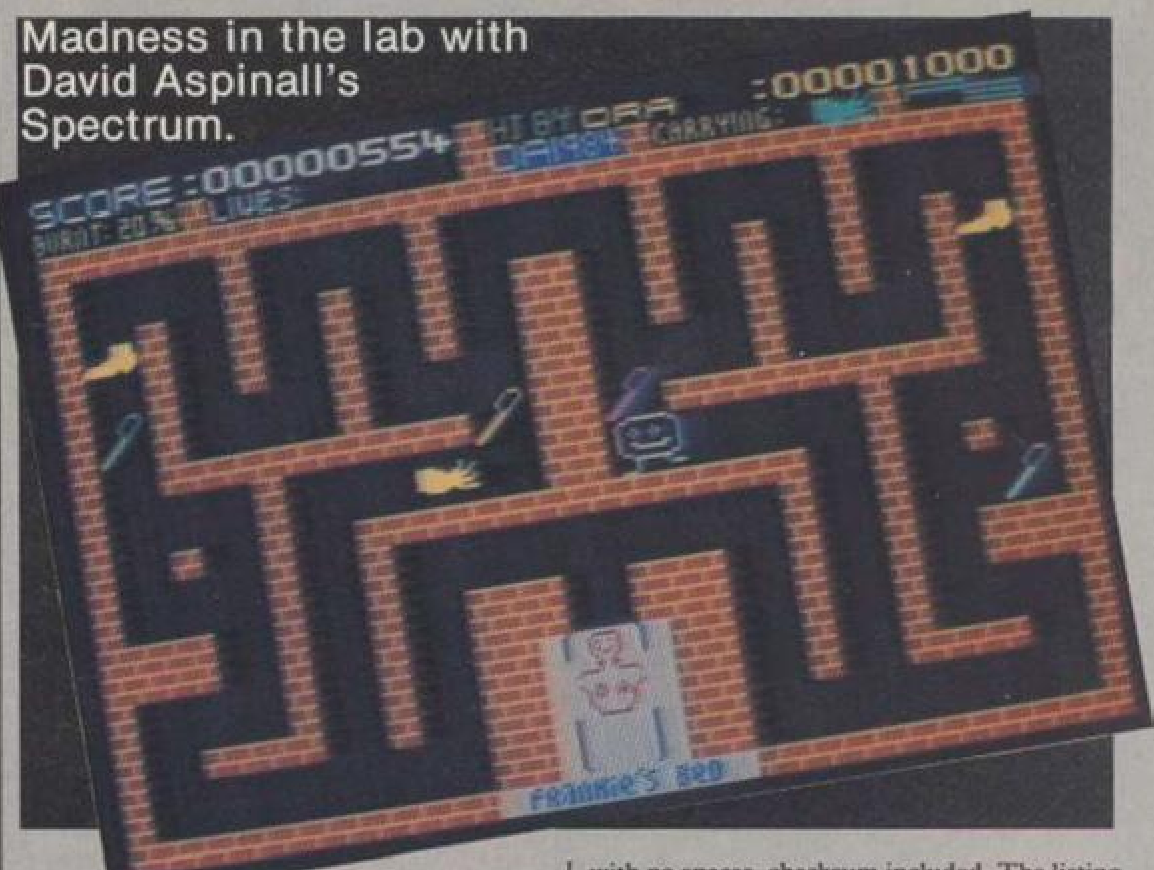
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ALIQUID SIMPLEX



Madness in the lab with David Aspinall's Spectrum.

EVERYTHING IS going wrong for Professor Hilfe today. First, he leaves his laboratory after a bad day's work to get a bite to eat. When he returns, it is only to find that he left the power on, connected to his experiment. The circuitry has overheated, and caused his generators to fail, sending massive power surges throughout the laboratory. This has caused a fire to break out, and if that wasn't enough, it has somehow caused all his chemical apparatus to come alive!

But, all is not lost for Hilfe. For the main pieces of his pride and joy, Frankie his robot, are still intact, although scattered around. If he could just manage to carry each piece, one a time to Frankie's bed then his life's work might be saved. But will it all end there? You have to guide Professor Hilfe around his laboratory, avoiding Barmy Bunsens, Crazy Conicals, Terrible Test-tubes and the like, taking one part of Frankie at a time to his bed.

I have written a special loader for typing in the hex codes, which are extensively check-summed. Another problem created in the writing of this program, is that the code isn't all in one place. In fact roughly two-thirds of it is above RAMtop, and the rest below: 3K in a Rem line and a further 118 bytes crammed into the printer buffer. For this reason, we will have to modify the hex loader twice to put the code in place.

So, first things first. It is best to have at least one totally blank short tape on which to put the finished product, and another on which to store the hexloaders and half-finished efforts. I shall now detail the procedure step by step:



1. Type in the loader program for the finished game, but don't run it. Save this at the beginning of your blank tape, using
   SAVE "ALIQUID" LINE 1

2. New the computer, type
   CLEAR 26969

   and enter the first version of the hexloader. Save this on another tape.

3. Now start typing in the main bulk of the machine code, from Dump 1. If at any time you wish to stop and start again later, type S and then save the program on the other, non-finalised tape. Enter the hex digits one row at a time with no spaces, checksum included. The listing format will be the same as it is here. If at any time a checksum doesn't correspond to the total modulus 256 of the eight other bytes entered, a Beep will sound, and you will get the same prompt address to enter that row again.

4. Once you have finished this, the loader will end, and you can save the resultant code after the loader program on the finalised tape:
   SAVE "MC"CODE 26970,5798

5. Now edit the following lines of the hex-loader and change them to:

```
 10 FOR N = 23363 TO 23481 STEP 8
100 SAVE "SO FAR" LINE 120 :
    SAVE"XDAT"CODE 23363,118
120 RANDOMISE N: LOAD""CODE :
    GOTO 12
```

6. Run the hexloader again, and enter the data from Dump 2, the printer buffer data. When this is all correct, type:
   SAVE "XDAT"CODE 23363, 118

   and record on to the finalised tape.

7. Next, edit the hexloader again:

```
 10 FOR N = 29800 to 32755
100 SAVE "AS SO FAR"CODE 29800,
    N – 29799
120 RANDOMISE N : CLEAR 29799 : LOAD
    ""CODE: LETN = PEEK
    23670 + 256*PEEK
    23671: CLS: GOTO 12
```

8. Now type as a direct command
   CLEAR 29799: RUN

   and enter the codes from Dump 3, once again use S to save a partly finished version.

9. After you have finished this, do not save it on the finalised tape but the other one, and with:
   SAVE"REMLINE"CODE 29800,2955

10. Now pull out the plug or otherwise clear the computer, and type in the Rem creator program; take care with the machine code in

(continued on page 87)

Loader program for finished games.

```
  10 BORDER 0: PAPER 0: INK 0: C
LEAR 26970: PRINT INK 7;AT 10,1;
" ALIQUID SIMPLEX IS LOADING..."
;AT 8,10; INK 6;"PLEASE WAIT";AT
 0,0;: LOAD ""CODE : LOAD ""CODE
 : LOAD ""
```

The hexloader.

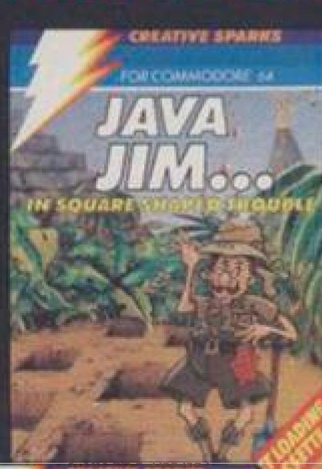
```
   5 DEF FN H(H$)=16*(CODE H$(1)
-48-(7 AND H$(1)>"9"))+CODE H$(2
)-48-(7 AND H$(2)>"9")
  10 FOR N=26970 TO 32767 STEP 8
  12 PRINT N;: LET C=0: POKE 236
58,8: INPUT LINE H$
  14 IF H$="S" THEN GO TO 100
  18 IF H$="E" THEN STOP
  20 IF LEN H$<>18 THEN PRINT "
ERROR": BEEP .1,-10: GO TO 12
  22 FOR M=0 TO 7
  24 POKE N+M,FN H(H$(M*2+1 TO M
*2+2)): LET C=C+PEEK (N+M)
  26 PRINT " ";H$(M*2+1 TO M*2+2
);
  28 NEXT M
  30 IF FN H(H$(17 TO 18))=C-256
*INT (C/256) THEN PRINT "=";H$(1
7 TO 18): NEXT N: PRINT '"O.K.!
!": STOP
  32 PRINT '"ERROR": BEEP .1,0:
GO TO 12
 100 SAVE "SO FAR" LINE 120: SAV
E "AS CODE SO FAR"CODE 26970,N-2
6969
 110 PRINT '"SAVED...": STOP
 120 RANDOMIZE N: CLEAR 26969: L
OAD ""CODE : LET N=PEEK 23670+25
6*PEEK 23671: CLS : GO TO 12
```

The Rem creator.

```
  10 FOR N=32600 TO 32644: READ
A: POKE N,A: NEXT N: RANDOMIZE U
SR 32600: PRINT " NOW DELETE LIN
ES 10 AND 100 "
 100 DATA 33,202,92,1,145,11,205
,85,22,33,203,92,34,83,92,54,0,3
5,54,1,35,54,141,35,54,11,35,54,
234,1,138,11,30,88,35,115,11,120
,177,32,249,35,54,13,201
```

QUALITY CONTROL FROM CREATIVE SPARKS ON C64

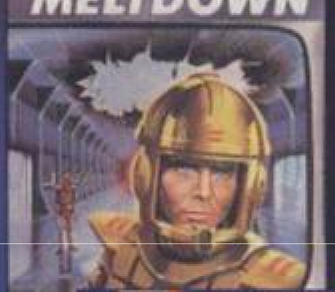
For those who demand excellence



JAVA JIM

Guide Java Jim around the screen digging neat square holes as he searches for ancient relics. You will have to avoid the lumps of sizzling lava being continually showered down on Jim from the still active volcano in this highly original fun game.

4 full graphic all action screens.
20 levels of play.
High score feature.
Fast loading cassette.



COUNTDOWN TO MELTDOWN

An amazing graphic action adventure game which puts you in charge of a team of androids trying to reach the core of a nuclear reactor before it explodes.
This game has over 2000 rooms to be negotiated and every single one of them is in 3D!!
Probably the most exciting game yet developed for the C-64.
Fast loading cassette.

BIRD MOTHER

This is a delightfully original game which uses nature as the setting for a highly compelling and challenging game. Guide the Bird Mother as she builds her nest and raises her young, finally protecting them from a predator hawk.
Fast loading cassette.
The stunning graphics and music in Bird Mother are not to be missed.



WING COMMANDER

This is a highly sophisticated flight combat simulator which puts you in the pilots seat. Highly advanced machine code programming has ensured you feel every stomach lurching dive and roll.
With 17 separate controls to be monitored and several ground targets to be defended from the attacking enemy bombers. This game will stretch your skills to their limits.
Fast loading cassette.

CREATIVE SPARKS

Available from All good computer software stockists.

Send me (tick as required)

- ☐ **JAVA JIM** TNCE163 (C64) **£7.95**
- ☐ **COUNTDOWN TO MELTDOWN** TNCE273 (C64) **£7.95**
- ☐ **BIRD MOTHER** TNCE263 (C64) **£7.95**
- ☐ **WING COMMANDER** TNCE203 (C64) **£7.95**
- ☐ My local stockist's address
- ☐ Your full list of games

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+ single P&P sum		:	30p
Total to send	£	:	p

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Department MO,
296 Farnborough Road,
Farnborough, Hampshire, GU14 7NF.
Telephone: (0252) 518364.

Name
Address

YC1184

(continued from page 85)

the Data at line 1000 as it isn't checksummed. Run this, then delete 100 and then 10. You should now be shown the long Rem at line 1 the machine has created — just to save you some typing! Try to avoid pressing Enter now or after reports as you'll have to sit through the listing again. Type:

LOAD "REMLINE" CODE 23760

and reload the data you save earlier from Dump 3. The Rem will now not list properly, and should have 1 Rem Dacode at the top. Type line 10 in, as below:

10 RANDOMISE USR 23762

and now save the completed program on the finalised tape after 'Xdat', using:

SAVE "ALL. MAIN" LINE 10

11. Now clear the computer, rewind the tape and test it all.

If anyone who does not fancy typing in the program would like a tape of it, I can supply them at £3 each so long as you write your address clearly, from 16 Viking Way, Pilgrims Hatch, Brentwood, Essex, CM15 9HX.

23363	57	65	6C	6C	20	44	6F	6E=D5
23371	65	7B	7B	FF	48	69	6C	68=DD
23379	65	20	67	6F	74	20	6F	75=D3
23387	74	20	6F	66	20	74	68	61=C6
23395	74	20	6F	6E	65	60	FF	42=77
23403	55	54	5B	5B	5B	5B	5B	5B=CB
23411	FF	48	61	6D	65	20	61	74=8D
23419	20	4C	61	73	74	78	FF	50=7E
23427	6C	65	61	73	65	20	74	79=17
23435	70	65	20	79	6F	75	72	20=E4
23443	69	6E	69	74	69	61	6C	73=5D
23451	FF	66	6F	72	20	74	68	65=A7
23459	20	68	69	67	68	20	73	63=B6
23467	6F	72	65	20	74	61	62	6C=09
23475	65	5B	5B	5B	FF	00	00	00=75

Dump 2.

Dump 1.

[illegible]

(continued on next page)

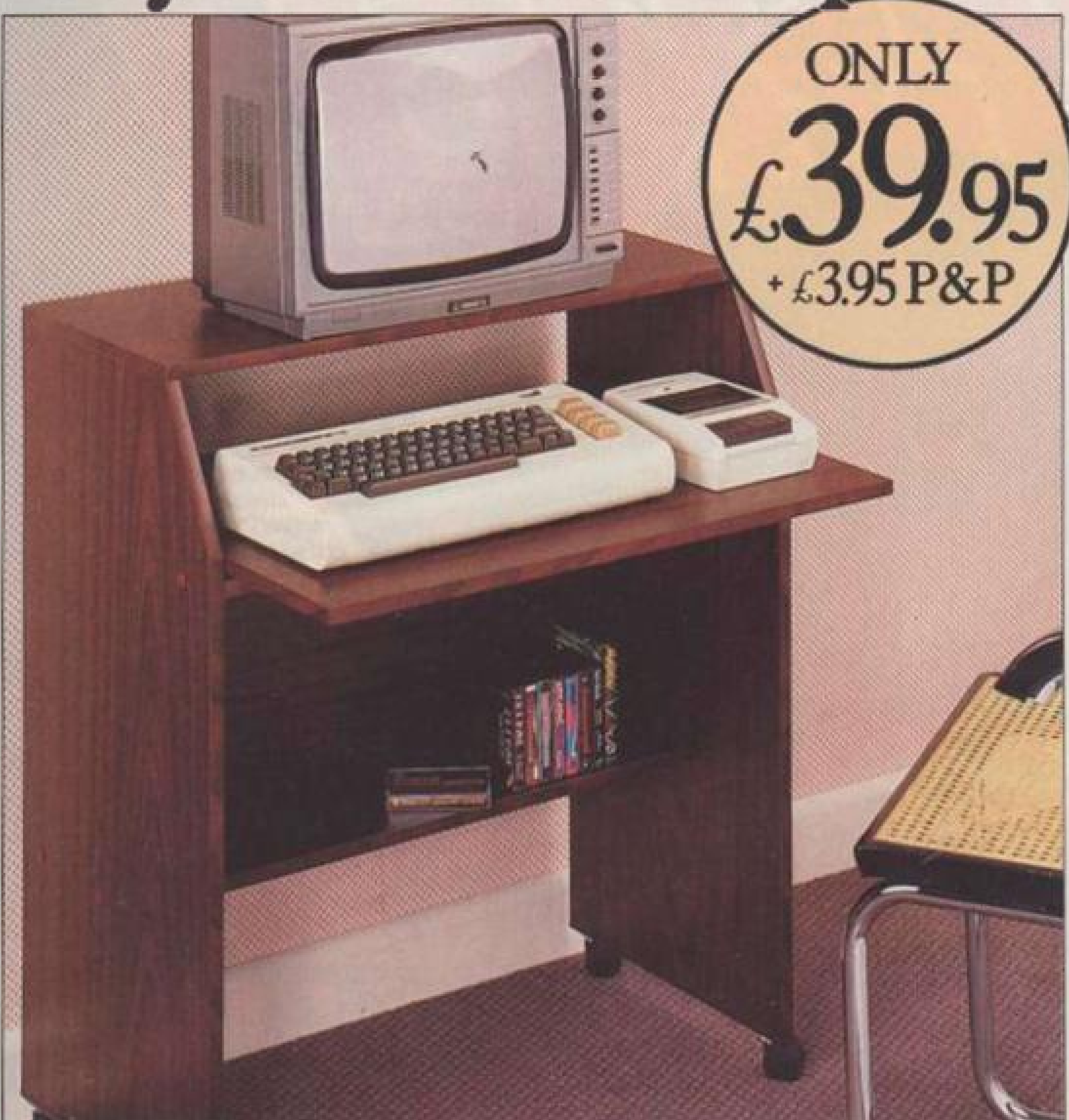
(continued from previous page)

[illegible]

Dump 3.

[illegible]

At last the ideal home for your home computer.



Now you can house your total computer system, video or hi-fi in superb style with these three elegant and practical cabinets. No more clutter. No trailing wires. And better protection for your valuable units.

And although you might expect beautiful furniture of this quality to cost the earth, the price is only £39.95 each (plus £3.95 p+p).



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	CL602	Mahogany		£39.95	
VIDEO CABINET	CL603	Teak		£39.95	
	CL604	Mahogany		£39.95	
HI-FI CABINET	CL605	Teak		£39.95	
	CL606	Mahogany		£39.95	

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GUNNER

Hit those planes before their air-to-ground missiles hit you in Tim Humphries BBC game.

THE OBJECT of Gunner is to stop the planes from passing over, towards their destination which is your local city.

You may rotate the gun 360 degrees to scan for the enemy planes which come screaming towards you in a 3D perspective form. When they are visible you must shoot them down with your gun sights which could be difficult, as they swerve and sweep and have a few pot shots at you as they go.

Unfortunately your guns can only withstand three hits resulting in destruction or, if you let 10 planes pass, you are retired from your position due to total destruction of your city.

```
10REM **** By Tim Humphries 1984 ****
20T%=RND(-3):HS%=500
30ENVELOPE1,3,0,0,0,0,0,0,121,-10,-5,-2,120,120
40ENVELOPE2,133,0,1,1,-10,0,0,121,-10,-10,-8,126,0
50VDU23,240,128,192,160,144,156,167,196,255,23,241,7,12,20,39,228,148,140,255
,23,248,16,16,16,254,16,16,16,0,23,254,60,126,255,255,255,255,126,60
60VDU23,250,0,0,0,48,48,48,48,0,23,255,255,255,255,255,255,255,255,255,23,245
,0,0,0,16,56,254,255,255,23,246,0,0,0,56,60,127,255,255,23,247,0,0,0,0,0,255,255
,255
70VDU23,233,0,0,0,0,0,0,24,24,23,234,0,0,0,0,24,60,60,60,23,235,0,0,0,24,60,6
0,126,60,23,236,0,0,56,124,56,124,254,124,23,237,0,60,126,126,60,126,255,126,23,
238,60,126,126,60,126,255,255,126
80FORJ%=230TO232:VDU23,J%,RND(255),RND(255),RND(255),RND(255),RND(255),RND(25
5),RND(255),RND(255):NEXT
90DIM CX%(30),CY%(30),A%(4):FORK%=0TO30:CX%(K%)=1+30*COS(K%/15*PI):CY%(K%)=1+
30*SIN(K%/15*PI):NEXT
100MODE7:VDU23;8202;0;0;0;:FORI%=0TO1:PRINTTAB(0,I%);CHR$141;CHR$132;CHR$157;S
PC13;CHR$131;"GUNNER":NEXT
110PRINTTAB(0,23);CHR$129;CHR$157;CHR$135;"  By Tim Humphries";TAB(24);"Copyri
ght 1984"
120PRINTTAB(5,4);CHR$130;"Keys :";TAB(6,7);CHR$129;"LEFT";CHR$131;"   'Z'";T
AB(6,9);CHR$129;"RIGHT";CHR$131;"   'X'";TAB(6,11);CHR$129;"UP";CHR$131;"
 '*'";TAB(6,13);CHR$129;"DOWN";CHR$131;"   '?'";TAB(6,15);CHR$129;"FIRE";
130PRINTCHR$131;"   'RETURN'";TAB(5,18);CHR$130;"OR Joystick";TAB(0,22);CHR$
132;CHR$157;SPC2;CHR$136;CHR$135;"PRESS SPACE OR FIRE TO START":PROCk
140MODE2:VDU23;8202;0;0;0;
150VDU19,0,6;0;19,15,0;0;19,13,0;0;19,14,4;0;19,5,7;0;
160GCOL0,2:MOVE0,0:MOVE1279,0:PLOT85,0,600:PLOT85,1279,600:GCOL0,4:MOVE0,605:D
RAW1279,605
170B$=STRING$(20,CHR$247)
180FORK%=0TO20:B$=B$+CHR$(244+RND(3)):NEXT
190B$=B$+CHR$241+CHR$240+CHR$241+CHR$240:BG%=10:FORK%=0TO20:B$=B$+CHR$(244+RND
(3)):NEXT:B$=B$+STRING$(20,CHR$247)
200T%=700:S%=0:HT%=2:PL%=0:PROCcrs
210PROClsc
220GCOL0,1:FORJ%=0TO20:MOVE639,0:MOVE639+680*COS(J%/20*PI),0+200*SIN(J%/20*PI)
:PLOT85,639+680*COS((J%+1)/20*PI),0+200*SIN((J%+1)/20*PI):NEXT
230FORI%=9TO12:VDU19,I%,1;0;:NEXT:VDU19,9,4;0;
240C%=9:FORJ%=0TO70:GCOL0,C%:MOVE639,0:DRAW639+680*COS(J%/70*PI),0+200*SIN(J%/
70*PI):C%=C%+1:IFC%=13 C%=9
250NEXT
260C%=9
270GCOL0,4:MOVE300,0:MOVE350,300:PLOT85,979,0:PLOT85,929,300:MOVE500,300:MOVE5
20,450:PLOT85,560,300:PLOT85,570,450:MOVE780,300:MOVE756,450:PLOT85,720,300:PLOT
85,710,450:GCOL0,13:MOVE300,0:DRAW350,300:DRAW929,300:DRAW979,0
280MOVE570,0:DRAW580,140:DRAW700,140:DRAW710,0
290MOVE430,0:DRAW460,300:MOVE849,0:DRAW819,300:GCOL0,6:MOVE460,0:MOVE470,150:P
LOT85,550,0:PLOT85,550,150:MOVE820,0:MOVE810,150:PLOT85,740,0:PLOT85,740,150
300GCOL0,3:MOVE480,130:VDU5,254,4:MOVE750,130:VDU5,254,4:GCOL0,13:MOVE500,110:
DRAW500,80:MOVE770,110:DRAW770,80:COLOUR3:PRINTTAB(15,0);HS%
310A%(0)=0:A%(1)=15:A%(2)=8:A%(3)=21:A%(4)=24:CP%=250:X%=RND(4096):X%=X%-1408:
Y%=620+RND(200):J=0:G=0:R%=0:E%=0:M%=3
320SOUND1,-15,150,1:FORI%=0TO500:NEXT:SOUND1,-15,150,1
330COLOUR14:PRINTTAB(8,18);:VDU255,9,9,255
340PROCplane
350COLOUR13
360REPEAT
370IFHT%<0PROCend:PROChisc:GOTO270
380PROCplane
390IFE%=1PROCspin:GOTO450
400J=J+G:G=G+.005
410IFRND(10)=5R%=RND(3)-2:FORQ%=0TO4:A%(Q%)=A%(Q%)+R%:NEXT
420X%=X%-(R%*(J*20)):Y%=Y%+(4*J)
430SOUND&14,-(J*4),98,10
440IFJ>2IFRND(10)=2PROCpf
450FORQ%=0TO4:IFA%(Q%)>29A%(Q%)=0
460IFA%(Q%)<0A%(Q%)=29
470NEXT
480IFJS%=1PROCjs:GOTO530
490IFINKEY-98 X%=X%+64:BG%=BG%-1:PROClsc:C%=C%-1
500IFINKEY-67X%=X%-64:BG%=BG%+1:PROClsc:C%=C%+1
510IFINKEY-73ANDT%<1040PROCcrs:T%=T%+16:PROCcrs
520IFINKEY-105ANDT%>670PROCcrs:T%=T%-16:PROCcrs
530IFC%>12 C%=9:VDU19,12,1;0;ELSEIFC%<9C%=12:VDU19,9,1;0;
540VDU19,C%,4;0;19,C%-1,1;0;:IFC%+1<13VDU19,C%+1,1;0;ELSEVDU19,13,0;0;
550IFX%<-1408X%=2688ELSEIFX%>2688X%=-1408
560IFX%>0ANDX%<1279ANDM%<>0COLOUR3:PRINTTAB(0,0);"IN RANGE":M%=0
570IFX%<0ANDM%>-1COLOUR3:PRINTTAB(0,0);"TO LEFT ":M%=-1
580IFX%>1279ANDM%<>1COLOUR3:PRINTTAB(0,0);"TO RIGHT":M%=1
590PROCplane
600IFJS%=1AND(ADVAL(0)AND1)=1PROCfr ELSEIFINKEY-74PROCfr
610IFE%=2PROCplane:SOUND0,-15,100,50:GCOL3,1:FORK%=0TO200:MOVEX%,Y%:VDU5,(229+
RND(3)),4:NEXT:GCOL0,2:MOVEX%,Y%:VDU5,255,4:Y%=2000:X%=4000
620UNTILY%>1100
630*FX15,0
640IFY%<2000PL%=PL%+1:FORK%=-12TO0:SOUND0,K%,98,2:NEXT:COLOUR1:PRINTTAB(0,0);P
L%;" PLANES":A%=INKEY(200):IFPL%=10PROCend:PROChisc:GOTO270
650PROCplane
660GOTO310
670DEFPROCjs
680JQ%=ADVAL(1)/65520*10:JR%=ADVAL(2)/65520*10
690IFJQ%>7X%=X%+64:BG%=BG%-1:PROClsc:C%=C%-1
700IFJQ%<3X%=X%-64:BG%=BG%+1:PROClsc:C%=C%+1
710IFJR%<3ANDT%>670PROCcrs:T%=T%-16:PROCcrs
720IFJR%>7ANDT%<1023PROCcrs:T%=T%+16:PROCcrs
730ENDPROC
740DEFPROCplane
750GCOL3,15:MOVEX%+CX%(A%(0))*J,Y%+CY%(A%(0))*J:DRAWX%+CX%(A%(1))*J,Y%+CY%(A%(
1))*J:MOVEX%,Y%:DRAWX%+CX%(A%(2))*(J/2),Y%+CY%(A%(2))*(J/2):ENDPROC
760DEFPROClsc
770COLOUR2
780IFBG%<1BG%=65ELSEIFBG%>65BG%=1
790PRINTTAB(0,12);MID$(B$,BG%,20)
800ENDPROC
810DEFPROCcrs
820GCOL3,7:MOVE620,T%:VDU5,248,4:ENDPROC
830DEFPROCfr
840*FX21,4
850VDU19,14,2;0;:GCOL3,7:SOUND0,2,102,2:FORI%=0TO1:MOVE540,450:DRAW640,T%-20:D
RAW740,450:NEXT:VDU19,14,4;0;:PN%=POINT(639,T%-20):IFPN%=13OR PN%=15PROCexp
860ENDPROC
870DEFPROCexp
880*FX15,0
890S%=S%+(150-(J*30)):COLOUR1:PRINTTAB(9,0);S%:SOUND0,-15,100,5:E%=1:SP%=RND(4
):IFX%<639XX%=-20ELSEXX%=20
900SN%=100
910ENDPROC
920DEFPROCspin
930FORQ%=0TO2:A%(Q%)=A%(Q%)+SP%:NEXT:Y%=Y%-20
940IFY%<(590-(J*20))E%=2:*FX15,0
950SOUND&13,-10,SN%,10:SN%=SN%-1
960X%=X%+XX%:ENDPROC
970DEFPROCpf
980F%=X%+CX%(A%(3))*(J*7):G%=Y%+CY%(A%(3))*(J*7):H%=X%+CX%(A%(4))*(J*7):I%=Y%+
CY%(A%(4))*(J*7)
990*FX21,4
1000GCOL3,1:SOUND0,1,100,1:FORI%=0TO1:MOVE F%,G%:DRAW X%,Y%:DRAWH%,I%:NEXT
1010IFPOINT(F%,G%)=4MOVEF%,G%:PROChit(0)
1020IFPOINT(H%,I%)=4MOVEH%,I%:PROChit(1)
1030ENDPROC
1040DEFPROCend
1050*FX15,0
1060SOUND0,-15,100,20:COLOUR1
1070PROCplane:PRINTTAB(0,0);SPC19
1080ENDPROC
1090DEFPROChit(H%)
1100GCOL0,2
1110IFH%=0IFG%<200GCOL0,1ELSEIFH%=1IFI%<200GCOL0,1
1120VDU5,232,4:FORG%=0TO10:VDU19,4,1;0;19,4,4;0;:NEXT:HT%=HT%-1:ENDPROC
1130DEFPROChisc
1140GCOL0,0:MOVE0,640:MOVE1279,640:PLOT85,0,1023:PLOT85,1279,1023
1150IFS%<HS%PRINTTAB(6,10);"THE END":PROCk:PRINTTAB(6,10);SPC8:T%=700:S%=0:HT%
=2:PL%=0:PROCcrs:ENDPROC
1160HS%=S%
1170FORH%=0TO10:PROCfr:NEXT
1180VDU5:GCOL0,1:MOVE140,900:PRINT"CONGRATULATIONS!":MOVE240,850:PRINT"YOU NOW
HOLD":MOVE190,800:PRINT"THE HIGH SCORE"
1190T%=700:S%=0:HT%=2
1200*FX15,0
1210PROCk:GCOL0,0:MOVE0,640:MOVE1279,640:PLOT85,0,1023:PLOT85,1279,1023:PROCcr
s:ENDPROC
1220DEFPROCk
1230REPEAT:JS%=(ADVAL(0)AND1):UNTILJS%=1OR INKEY-99:ENDPROC
```

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commodore 64

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ELEVATORS

H. Kaljouw gives your Vic a little lift

VIC

ELEVATORS IS A GAME of skill written for the unexpanded Vic-20. The elevators have run amok in a huge building. They have to be switched off but there is one problem, the main switch is on the top floor of the building. The elevators are useless so you will have to use the stairs.

So far it looks easy but there are a few problems. First of all you have to dodge the eight elevators, which is pretty tough in itself, and secondly you have a time limit to cross each floor. If you get hit by an elevator or if you pass the time limit you are dead, and you have to start at the ground level again. At the start of the game the time limit is 15 seconds. If you manage to reach the top of the building the time limit decreases by 2.5 seconds. You have three lives.

There is a bonus to be found in the middle of each floor, except for the ground level. Each bonus is numbered from one to four. When you walk through a bonus, it is automatically replaced by another one which is worth a further 100 points. The highest bonus is worth 400 points.

Each time you cross a floor safely, you automatically go to the next floor. You get 500 points plus extra points depending on the time you have left. When you have crossed the top floor safely you get 4,000 points. Then you have to start at the ground level again. The time limit goes down by 2.5 seconds.

Elevators uses machine code and 25 user-defined characters. To make the game fit in the unexpanded Vic I had to write it in three parts, and even then there was no space left to add Rem statements.

Program 1 contains the data for the machine code and the user-defined characters. There are checksums for both. If you have typed in a wrong number the program will end with an error message. After program 1 is run it automatically loads and runs the second program.

Program 2 gives you the title screen, instructions and the scoretable. It also tells you which key to use — "," = left and "." = right. After program 2 is run, it also auto-

(continued on page 95)

Program 3.

```
1 REM * ELEVATORS 3 *
2 REM
3 POKE36879,142:PRINT"□■":POKE36869,255:POKE36878,10:POKE7160,184:POKE7161,11
4 HI=PEEK(7160)+256*PEEK(7161)
5 GOSUB900
10 P=8120:X=0:SC=0:R=0:V1=32:V2=32:W=0:N=3:F=60
15 F=60:TI$="000000"
20 GOTO100
30 SYS7137
40 GOTO575
100 Q1=PEEK(203):IFQ1<>37ANDQ1<>29THEN110
105 R=-1:IFQ1=37THENR=1
110 IFX=0ANDR=-1THENR=0:GOTO160
115 IFX=20ANDR=1THENR=0:GOTO160
117 IFR=0THENFORA=1TO70:NEXT:GOTO160
118 Q1=PEEK(P):Q2=PEEK(P-22):IFQ1<30ORQ1>59THENV1=Q1:V2=Q2:GOTO600
119 IFQ2<30ORQ2>59THENV1=Q1:V2=Q2:GOTO600
120 Q1=PEEK(P+R):Q2=PEEK(P+R-22)
121 POKE36875,200:POKE36875,0
125 IFQ1>37ANDQ1<42THEN800
130 IFQ1=32ANDQ2=32THEN150
135 IFQ1=33ANDQ2=33THEN150
140 IFQ1=30ANDQ2=30THEN700
145 GOTO600
150 POKEP,V1:POKEP-22,V2:P=P+R:X=X+R
155 V1=Q1:V2=Q2
160 POKEP,45+2*R:POKEP-22,44+2*R:POKEP+30720,1:POKEP+30698,1
165 GOTO30
500 FORA=1TO130:POKE36879,132:POKE36876,255-A:FORB=1TO13:NEXT:POKE36879,140:NEXT
510 POKE36877,0:W=4000:GOSUB850:POKEP,30:POKEP+30720,6:POKEP-22,30:POKEP+30698,6
:P=8120
515 FORA=7734TO8064STEP66:POKEA,38:POKEA+30720,1:NEXT
520 X=0:R=0:V1=32:V2=32:TI$="000000":F=F-10:GOTO160
575 K=INT(TI/F):IFK=0THEN586
582 POKE7833+K*22,37:IFK>1THENPOKE7811+K*22,37
585 IFK>14THEN600
586 GOTO20
600 N=N-1:POKE36877,220:FORL=15TO1STEP-1:POKE36879,L:FORM=1TO77:NEXT:NEXT:POKE36
877,0
610 POKE36878,10:IFN=0THEN650
620 POKEP,V1:POKEP-22,V2:FORA=1TON-1:POKE8195-A,44:NEXT:POKE8195-A,32:TI$="00000
0"
625 IFN=1THENPOKE8184,32
630 FORA=7855TO8163STEP22:POKEA,36:NEXT:P=8120:X=0:V1=32:V2=32:R=0:GOTO160
650 PRINT"[illegible]GAME OVER":PRINT"[illegible]PLAY AGAIN Y/N":POKE7161,INT
(HI/256)
655 POKE7160,(HI-PEEK(7161)*256):GETA$
657 IFA$="Y"THENCLR:GOTO4
660 IFA$="N"THENPRINT"□":POKE36869,240:END
665 GOTO655
700 POKEP,32:POKEP-22,32:P=P+R:X=X+R:POKEP,45:POKEP-22,44:POKEP+30720,1:POKEP+30
698,1
727 IFP=7744THEN500
730 FORA=PTOP-44STEP-22:POKEA,30:POKEA+30720,6:POKEA-22,45:POKEA+30698,1:POKEA-4
4,44
740 POKEA+30676,1:NEXTA:FORB=60TO1STEP-8:FORV=192-BTO192+BSTEP4:POKE36876,V
760 NEXTV,B:W=500+INT(15-K)*15:GOSUB850:P=P-66:R=0:V1=32:V2=32:TI$="000000"
770 FORA=7855TO8163STEP22:POKEA,36:NEXT:GOTO160
800 POKEP,V1:POKEP-22,V2:P=P+R:X=X+R:W=(Q1-37)*100:V1=Q1+1:V2=32:IFQ1=41THENV1=3
2
830 GOSUB850:GOTO160
850 SC=SC+W-20*INT(W/20)
855 FORT=1TOW/20
860 SC=SC+20:IFSC>HITHENHI=SC
865 PRINT"[illegible]"SC;TAB(8);HI"■"
870 POKE36876,230:POKE36876,250:POKE36876,0
875 FORQ1=1TO5:NEXT
880 NEXTT
```

(program 3 continued on page 95)

MODEM.

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(continued from page 93)

matically loads and runs the next program.

Program 3 is the main program. The little man is controlled by Basic, the elevators by machine code. At first the man is stationary. When you press "." he starts walking to the right.

Once the man has started walking, he cannot be stopped. The only way to protect him from being hit by an elevator is by making him walk back by pressing the ",". This makes dodging elevators very hard. Program 3 also keeps a high score which is 3,000 at the start.

The automatic Load Run in programs 1 and 2 is done by following

POKE 631, 131: POKE 198, 1: NEW

This line is equivalent to holding down the Shift-key and then hitting the Run/Stop key. By putting this line at the end of a program it automatically Loads and Runs the next program on tape. So you should Save program 2 immediately after program 1 and program 3 immediately after program 2.

After typing in programs 1 and 2 you have to Save them before Running them because they both and with a New statement and will destroy themselves. ■

(program 3 continued from page 95)

```
885 RETURN
900 PRINT"J######################"
904 FORT=1TO6
906 PRINT"XX## # # # ### # # # ##"
908 NEXT
910 PRINT"XX######################L"
911 PRINTSC;TAB(8);HI"M"
912 FORX=2TO18STEP2
913 IFX=10THENNEXT
914 Y=INT(15*RND(X)+2)
916 FORT=1TOY-1
918 POKE7680+T*22+X,33:POKE38400+T*22+X,7
920 POKE36876,135+T*7
922 FORP=1TO60:NEXT
923 POKE36876,0
924 NEXTT
926 P=7680+X+22*Y
927 T=30720+P:POKET,7:POKET+22,7:POKET+44,7
928 T=RND(X)*2:IFT>1THEN932
930 POKEP,27:POKEP+22,28:POKEP+44,29:GOTO934
932 POKEP,60:POKEP+22,61:POKEP+44,62
934 NEXTX
936 POKE8098,44:POKE8120,45
937 POKE8185,31:POKE38905,7
938 FORP=7855TO8163STEP22:POKEP,36:T=6:IFP>8053THENT=7
939 POKEP+30720,T:NEXT
940 FORY=3TO15STEP6
942 FORT=YTOY+2
943 POKE38400+22*T,6
944 POKE7680+22*T,30:NEXT:NEXT
946 FORY=0TO18STEP6
948 FORT=YTOY+2
949 POKE38420+22*T,6
950 POKE7700+22*T,30:NEXT:NEXT
951 POKE8183,44:POKE8184,44
955 FORA=7734TO8064STEP66:POKEA,38:POKEA+30720,1:NEXT
960 RETURN
```

ELEVATORS

Program 1.

```
1 REM * ELEVATORS 1 *
2 REM
5 POKE36879,110:PRINT"JQQQQQQQQQQPLEASE WAIT..."
10 POKE56,27:POKE55,0:POKE52,27:POKE51,0:S=0
20 FORP=0TO240
30 READD$:D1$=LEFT$(D$,1):D2$=RIGHT$(D$,1)
40 D1=ASC(D1$):D2=ASC(D2$)
50 G1=D1-48:IFD1>57THENG1=D1-55
60 G2=D2-48:IFD2>57THENG2=D2-55
70 G=16*G1+G2:S=S+G
80 POKE6912+P,G
90 NEXT
95 IFS<>25925THENPRINT"DATA ERROR IN 500-740":END
97 FORP=0TO511:POKE7168+P,PEEK(32768+P):NEXT
100 GOSUB1000
480 PRINT"J"
490 POKE631,131:POKE198,1:CLR:NEW
499 END
500 DATA A2,AF,BD,DC,1E,C9,1B,D0,12,9D
510 DATA F2,1E,A9,1C,9D,08,1F,A9,1D,9D
520 DATA 1E,1F,A9,21,9D,DC,1E,CA,D0,E4
530 DATA A2,C6,BD,16,1E,C9,1B,D0,12,9D
540 DATA 2C,1E,A9,1C,9D,42,1E,A9,1D,9D
550 DATA 58,1E,A9,21,9D,16,1E,CA,D0,E4,60
560 DATA A2,00,BD,58,1E,C9,3E,D0,12,9D
570 DATA 42,1E,A9,3D,9D,2C,1E,A9,3C,9D
580 DATA 16,1E,A9,20,9D,58,1E,E8,E0,F2
590 DATA D0,E2,A2,00,BD,4A,1F,C9,3E,D0
600 DATA 12,9D,34,1F,A9,3D,9D,1E,1F,A9
610 DATA 3C,9D,08,1F,A9,20,9D,4A,1F,E8
620 DATA E0,84,D0,E2,60
630 DATA A2,15,BD,8C,1F,C9,1B,D0,0F,A9
640 DATA 3C,9D,8C,1F,A9,3D,9D,A2,1F,A9
650 DATA 3E,9D,B8,1F,CA,10,E7,60
660 DATA A2,15,BD,16,1E,C9,3C,D0,0F,A9
670 DATA 1B,9D,16,1E,A9,1C,9D,2C,1E,A9
680 DATA 1D,9D,42,1E,CA,10,E7,60
690 DATA A2,FF,BD,00,1E,C9,1E,30,04,C9
700 DATA 3C,30,05,A9,07,9D,00,96,CA,D0
710 DATA ED,A2,00,BD,00,1F,C9,1E,30,04
720 DATA C9,3C,30,05,A9,07,9D,00,97,CA,D0,ED,60
730 DATA 20,00,1B,20,3D,1B,20,7E,1B,20
740 DATA 9A,1B,20,B6,1B,60
1000 S=0:FORA=1TO26
1002 READX:S=S+X:FORI=XTOX+7:READY:S=S+Y:POKEI,Y:NEXTI
1004 NEXTA
1005 IFS<>216859THENPRINT"XXQQQQQQDATA ERROR"
    :PRINT"QQQQIN 1000 - 1260":END
1006 RETURN
1010 DATA 7384,24,36,66,129,255,255,255,153
1020 DATA 7392,153,153,187,187,255,255,219,255
1030 DATA 7400,255,189,129,195,255,255,126,0
1040 DATA 7408,255,129,129,129,255,129,129,129
1050 DATA 7416,255,0,0,0,0,0,0,0
1060 DATA 7432,8,8,8,8,8,8,8,8
1070 DATA 7448,223,223,223,0,253,253,253,0
1080 DATA 7456,93,93,93,93,93,93,93,93
1090 DATA 7464,65,65,65,65,65,65,65,65
1100 DATA 7472,126,129,153,185,153,153,189,129
1110 DATA 7480,126,129,189,141,189,177,189,129
1120 DATA 7488,126,129,189,141,189,141,189,129
1130 DATA 7496,126,129,173,173,189,141,141,129
1140 DATA 7504,0,24,24,255,24,56,8,24
1150 DATA 7512,56,56,60,28,8,24,8,56
1160 DATA 7520,0,24,24,255,60,60,24,255
1170 DATA 7528,255,126,60,126,66,66,66,231
1180 DATA 7536,0,24,24,255,24,28,16,24
1190 DATA 7544,28,28,60,56,16,24,16,28
1200 DATA 7648,24,36,66,129,255,255,255,221
1210 DATA 7656,221,153,153,153,255,255,219,255
1220 DATA 7664,255,189,129,195,255,255,126,0
1230 DATA 7632,8,16,32,32,32,32,16,8
1240 DATA 7640,16,8,4,4,4,4,8,16
1250 DATA 7672,0,2,4,8,16,32,64,0
1260 DATA 7168,0,126,126,102,102,126,126,0
```

Program 2.

```
1 REM * ELEVATORS 2 *
2 REM
5 POKE36878,10
8 POKE36869,255:POKE36879,110:PRINT"J"
9 PRINT"JQQ":S$=""
10 FORA=3TO17
20 READA$:A$="QQ"+A$
30 PRINT"QQQQQQQQQQQQQQQQQQQQQQ";A$
40 FORB=21TOASTEP-1
50 PRINT"TT";A$
51 IFA$="QQ  "THEN54
52 POKE36876,240-3*B
54 FORT=1TO8:NEXT:POKE36876,0
60 PRINTS$:PRINT"TT"
70 NEXTB
80 NEXTA
90 FORT=1TO10000:NEXT
100 PRINT"J"
105 POKE36869,240
110 FORA=3TO21STEP2
120 READA$:A$="QQQ"+A$
130 PRINT"QQQQQQQQQQQQQQQQQQQQQQ";A$
140 FORB=21TOASTEP-1
150 PRINT"TT";A$
155 POKE36876,240-5*B:FORT=1TO10:NEXT:POKE36876,0
160 PRINTS$:PRINT"TT"
170 NEXTB
180 NEXTA
200 GETA$:IFA$=""THEN200
205 POKE36869,255
210 FORA=2TO20STEP2
220 READA$:A$="QQQ"+A$
230 PRINT"QQQQQQQQQQQQQQQQQQQQQQ";A$
240 FORB=21TOASTEP-1
250 PRINT"TT";A$
255 POKE36876,240-5*B:FORT=1TO10:NEXT:POKE36876,0
260 PRINTS$:PRINT"TT"
270 NEXTB
280 NEXTA
290 PRINT"QQ      PRESS A KEY"
300 GETA$:IFA$=""THEN300
310 PRINT"JQQQQQQQQQPLEASE WAITJ":POKE631,131:POKE198,1:NEW
799 END
800 DATA "@@@ @   @@@ @ @ @@@","@   @   @   @ @ @ @","@@ @   @@  @ @ @@@"
810 DATA "@  @   @  @ @ @ @","@@@ @@@ @@@  @  @ @","  "," "
820 DATA"  @@@ @@@ @@@ @@@","  @ @ @ @ @ @ @","  @  @ @ @@@ @@@"," @ @ @ @
   @"
830 DATA"  @  @@@ @ @ @@@","  ","  ","   QBY H.KALJOUWQ"
900 DATA"  QINSTRUCTIONSQ","TRY TO REACH","THE TOP OF THE","BUILDING. DODGE"
910 DATA"THE ELEVATORS.","IF YOU DON'T OR","IF YOU PASS THE","TIME-LIMIT YOU"
920 DATA"ARE DEAD.","QQQPRESS A KEYQ"
940 DATA"QQ* KEYS USED *QQ","LEFT          RIGHT","*Q* Q          Q /Q,Q"
950 DATA"QQ SCORE  TABLE *QQ","@   BONUS    100","'   BONUS    200","<   BONUS
   300"
960 DATA")   BONUS    400","EACH FLOOR    500","EACH SCREEN 4000"
```

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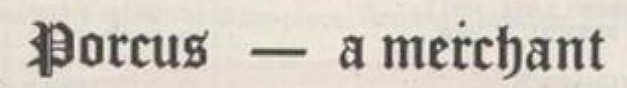
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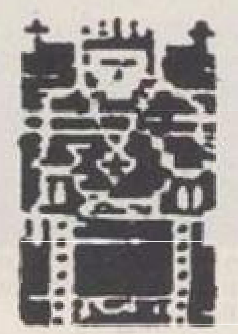
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and finally

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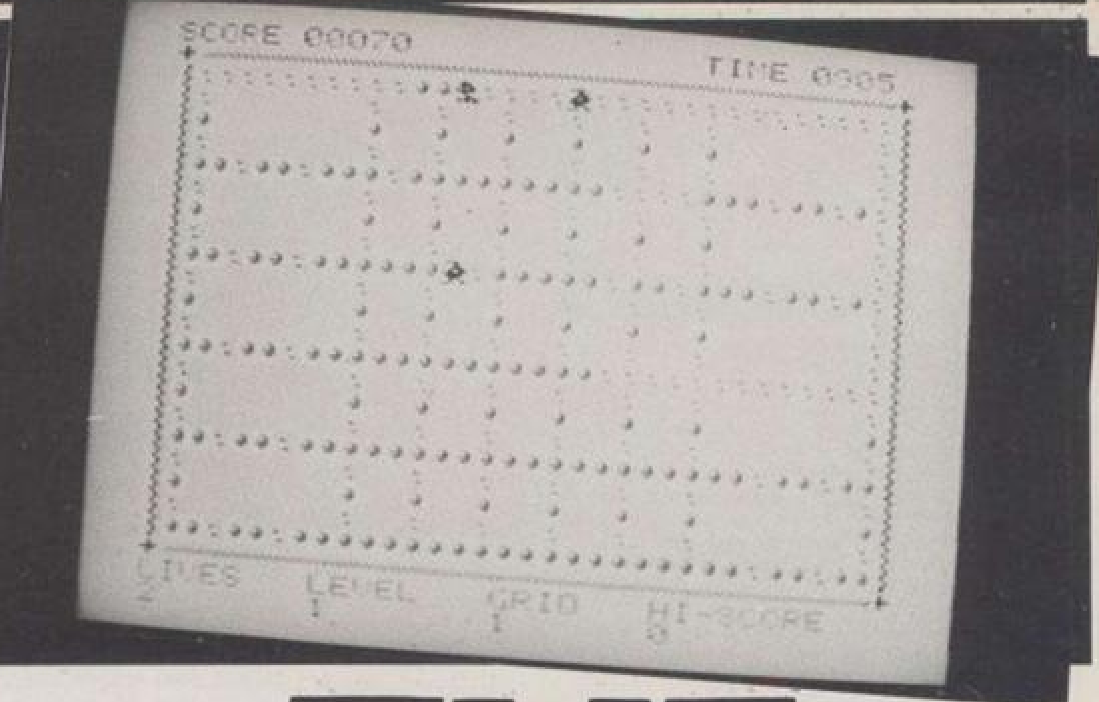


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Boots

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ORIC



THE BROOD

Go to work on an egg in P.H. Phoeng's cracking game for the Oric or Atmos computer. Go on and poke that yolk!

BROOD IS WRITTEN on an Oric-1 48K computer. But as I have not used any bugged Basic commands nor any ROM calls, only a few changes need to be made for Atmos conversion.

Just add one to the X-coordinate of the Plot commands in the following lines: 115, 270, 275, 315, 380, 400, 640, 645, 650, 680, 685, 695, 700, 705, 775, 2005, 2140. Also change

FOR A = 3 TO 34

in line 690 into

FOR A = 4 TO 35

The main loop of the game is written in machine code — #9800-#9A50, entered with Basic — while the rest is written in Basic. The program uses approximately 7K of RAM memory.

The game can be played with the keyboard or with a joystick attached to the right port of a Pase joystick interface. The player is also offered a choice in sound volume.

The player finds himself on a grid in an incubator and the object is to destroy the Munzter's eggs before they hatch. The brood-gridders, who protect the eggs, will make the job a bit harder. But while the player is able to leave the grid, these brood-gridders have to stay on the grid.

The player is equipped with the z-ray, a weapon that will freeze the brood-gridders but at the same time speeds up — by 10 times — the hatching of the eggs.

When all eggs are destroyed the player moves on to the next grid. There are nine different grids. There is a life bonus after every third finished grid while the speed level will be increased after every sixth grid.

If you want to practice on a particular grid, change the grid variable (GR) in line 655.

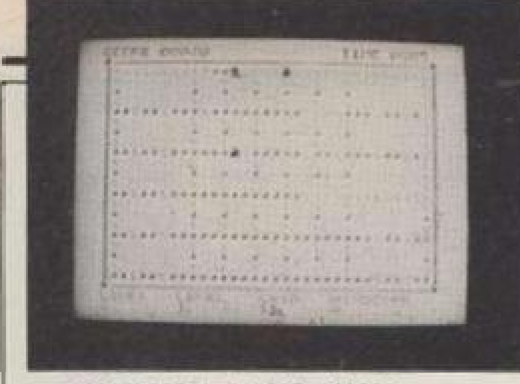
Variables.

GR	:	grid number
HI	:	high score
LE	:	speed level
LI	:	lives
R	:	finished grids counter
SC	:	score
T & T$	:	time
V	:	sound volume

Oric Brood.

```
5 TEXT:CLS:PAPER3:INK4
10 HIMEM#97FF:POKE618,10
15 FORA=#BB80TO#BBA7
20 POKEA,19:NEXT
25 PRINT"LOADING M.C."
30 GOTO1000
95 REM MAIN LOOP
100 SOUND1,RND(1)*99,V
105 CALL#9800
110 SOUND1,0,0:A=PEEK(17)
115 PLOT16,0,3+A*2:SOUND2,100,V*A
120 IFPEEK(15)<36THEN200
125 T=T-A*9-1:IFT<1THEN150
130 WAIT5-LE:GOTO100
150 REM EGGS HATCHED
155 POKE#BBCB,48:SOUND1,250,V
160 WAIT100:POKE4,165:POKE5,37
165 FORA=1TO30:SOUND1,150,V
170 CALL#99FA:SOUND1,0,0:NEXT
175 POKE5,167:CALL#99FA
180 SOUND2,900,V:WAIT100
185 POKE(DEEK(0)),162:POKE5,39
190 FORA=1TO51:SOUND2,A*5,V
195 CALL#99FA:NEXT
200 IFPEEK(15)=0THEN300
205 REM LOSE LIFE
210 A=DEEK(0):FORB=127TO32STEP-1
215 POKEA,B:SOUND2,B,V:NEXT
220 SOUND2,0,0
225 LI=LI-1:DOKE18,#BF91:PRINTLI
230 WAIT200:CLS
235 IFLI>0THEN660
240 SC$=""
245 FORA=#BBB1TO#BBB5
250 SC$=SC$+CHR$(PEEK(A))
255 NEXT:SC=VAL(SC$)
260 A$="GAME OVER"
265 IFSC>HITHENA$="HIGHEST SCORE":HI=SC
270 PLOT9,10,A$
275 PLOT9,12,"TRY AGAIN ? (Y/N)"
280 GETA$:IFA$="Y"THEN640
285 IFA$<>"N"THEN280
290 DOKE621,48000:POKE623,27:END
300 REM FINISHED
305 CLS:GR=GR+1
310 IFGR=10THENGR=1
315 PLOT14,9,"BONUS 0"
320 FORA=0TO3:B=#BBCB+A
325 POKE#BD26+A,PEEK(B):NEXT
330 FORA=1TO200:SOUND2,RND(1)*100,V
335 NEXT:SOUND2,0,0
340 C=0:FORA=0TO4:SOUND1,200+50*A,V
345 B=PEEK(#BBB5-A)+PEEK(#BD29-A)
350 B=B-48+C:C=0
355 IFB>57THENC=1:B=B-10
360 POKE(#BBB5-A),B+128
365 WAIT80:POKE(#BBB5-A),B
370 SOUND1,0,0:NEXT
375 R=R+1:IFR/3>INT(R/3)THEN430
380 PLOT14,11,"LIVE BONUS":LI=LI+1
385 FORA=0TO200:SOUND1,ABS(100-A),3
390 NEXT:SOUND1,0,0
395 IFR/6>INT(R/6)THEN430
400 PLOT14,13,"LEVEL INCREMENT"
405 IFLE<4THENLE=LE+1
410 FORA=1TO10:FORB=1TO6
415 MUSIC1,B,A,V:MUSIC2,1,A,V
420 WAIT1:NEXTB,A
425 SOUND1,0,0:SOUND2,0,0
430 WAIT200:GOTO660
600 REM INITIALIZE, SET UP SCREEN
605 PLAY3,2,0,0
610 CLS:PAPER3:INK0
625 FORA=1TO24:PRINT:NEXT
630 DOKE621,48080:POKE623,21
635 PRINT" LIVES","LEVEL","GRID","HI-SCORE"
```

(continued on next page)



(continued from previous page)

```
640 PLOT2,0,"SCORE 00000"
645 PLOT26,0,"TIME"
650 PLOT15,0,CHR$(12)+CHR$(3)+"Z-RAY"+CHR$(8)+CHR$(4)
655 SC=0:LI=3:LE=1:GR=1:R=0
660 CLS:DOKE18,#BF91
665 PRINTLI,"    "LE,"    "GR,"   "HI
670 A=INT(RND(1)*3)+20:IFA=20THENA=18
675 FORB=3TO23:POKE#BB80+40*B,A:NEXT
680 PLOT0,0,4:PLOT0,24,1:PLOT0,25,1
685 FORA=2TO22:PLOT1,A,9:NEXT
690 FORA=3TO34:PLOTA,1,38:PLOTA,23,38:NEXT
695 FORA=2TO22:PLOT2,A,38:PLOT35,A,38:NEXT
700 PLOT2,1,43:PLOT35,1,43
705 PLOT2,23,43:PLOT35,23,43
710 GOSUB900+GR*10
715 POKE0,251:POKE1,187:CALL#99A9
720 POKE0,252:POKE1,187
725 POKE2,A:POKE3,B:CALL#99D1
730 POKE0,C:POKE1,D
735 POKE2,E:POKE3,F:CALL#99D1
740 RESTORE
745 FORA=0TO18:READB:POKEA,B:NEXT
750 REM ZERO PAGE DATA
755 DATA252,187,1,1,36
760 DATA27,188,32,1,165
765 DATA59,191,32,21,165
770 DATA191,0,0,35
775 POKE16,G:PLOT31,0,T$
780 T=VAL(T$)
785 GOTO100
800 REM JOYSTICK DATA
805 POKE#9804,0:POKE#9805,4
810 POKE#9809,173:POKE#980A,176
815 POKE#980C,138:POKE#980D,24
820 POKE#980E,105:POKE#980F,32
825 POKE#9810,170:POKE#9814,191
830 POKE#9815,176
835 POKE#9820,183:POKE#983A,175
840 POKE#9854,190:POKE#986E,189
845 GOTO2200
900 REM GRID DATA
910 A=31:B=62:C=4:D=188:E=3:F=18
915 G=207:T$="1000":RETURN
920 A=31:B=62:C=255:D=187:E=5:F=30
925 G=183:T$="1000":RETURN
930 A=1:B=8:C=20:D=188:E=1:F=8
935 G=235:T$="1500":RETURN
940 A=3:B=15:C=15:D=188:E=3:F=15
945 G=181:T$="1500":RETURN
950 A=12:B=36:C=255:D=187:E=4:F=32
955 G=198:T$="1500":RETURN
960 A=8:B=32:C=3:D=188:E=8:F=32
965 G=183:T$="1000":RETURN
970 A=7:B=35:C=255:D=187:E=7:F=35
975 G=193:T$="1000":RETURN
980 A=2:B=12:C=17:D=188:E=2:F=12
985 G=215:T$="1500":RETURN
990 A=8:B=32:C=253:D=187:E=5:F=35
995 G=199:T$="1000":RETURN
1000 REM REDEFINE CHARACTERS
1005 FORA=0TO18:READB:NEXT
1010 FORA=47368TO47423
1015 READB:POKEA,B:NEXT
1020 REM BROOD-GRIDDER
1025 DATA28,4,14,27,62,28,10,49
1030 REM PLAYER
1035 DATA8,28,42,62,8,4,31,21
1040 DATA4,14,21,31,4,8,62,42
1045 REM GRID
1050 DATA0,0,8,0,0,4,0,0
1055 REM EGG
1060 DATA63,51,41,33,33,51,63,63
1065 REM EDGE
1070 DATA4,4,8,8,4,4,8,8
1075 REM MUNZTER
1080 DATA9,18,10,31;21,14,10,19
1085 FORA=46384TO46391
1090 READB:POKEA,B:NEXT
1095 DATA0,0,0,21,42,0,0,0
1100 REM MC
1105 FORA=#402TO#422
1110 READB$:B=VAL("#"+B$)
1115 POKEA,B:NEXT
1120 DATA AD,1,3,48,AD,3,3,48
1125 DATA A9,C0,8D,3,3,A9,80
1130 DATA 8D,F,3,AD,F,3,8D,0,4
1135 DATA 68,8D,3,3,68,8D,F,3,60
1140 FORA=#9800TO#9A50
1145 READB$:B=VAL("#"+B$)
1150 POKEA,B:NEXT
1155 DATA 20,2,4,AE,8,2,A0,0,E0,84,D0
1160 DATA 7,E6,11,4C,19,98,E6,11,E0
1165 DATA 38,F0,2,86,F,A6,F,A5,4,91,0
1170 DATA E0,84,D0,16,A2,0,20,D6,98
1175 DATA B1,0,C9,26,D0,6,20,E2,98,4C
1180 DATA AD,98,E6,3,4C,84,98,E0,9C
1185 DATA D0,16,A2,0,20,E2,98,B1,0,C9
1190 DATA 26,D0,6,20,D6,98,4C,AD,98
1195 DATA C6,3,4C,84,98,E0,AC,D0,16
1200 DATA A2,0,20,F5,98,B1,0,C9,26
1205 DATA D0,6,20,EE,98,4C,AD,98,C6,2
1210 DATA 4C,84,98,E0,BC,D0,E,A2,0,20
1215 DATA EE,98,B1,0,C9,26,D0,6,20,F5
1220 DATA 98,4C,AD,98,E6,2,C9,21,D0,3
1225 DATA 85,F,60,85,4,C9,A5,D0,1C,C6
1230 DATA 10,38,E9,81,85,4,A2,4,FE,B1
1235 DATA BB,BD,B1,BB,C9,3A,D0,9,A9
1240 DATA 30,9D,B1,BB,CA,4C,9A,98,A5
1245 DATA 12,49,1,85,12,91,0,A5,10,D0
1250 DATA 3,85,F,60,A5,11,C9,1,D0,3C
1255 DATA A2,3,BD,C7,BB,C9,30,D0,6,CA
1260 DATA D0,F6,60,EA,EA,A2,2,4C,95
1265 DATA 99,18,B5,0,69,28,95,0,90,2
1270 DATA F6,1,60,38,B5,0,E9,28,95,0
1275 DATA B0,2,D6,1,60,F6,0,D0,2,F6,1
1280 DATA 60,B5,0,D0,2,D6,1,D6,0,60
1285 DATA 84,11,A2,5,B5,4,81,0,E0,5
1290 DATA D0,17,A5,3,D5,3,B0,11,20,E2
1295 DATA 98,A1,0,C9,22,90,5,D6,3,4C
1300 DATA 7D,99,20,D6,98,A5,2,D5,2,B0
1305 DATA 11,20,F5,98,A1,0,C9,22,90,5
1310 DATA D6,2,4C,7D,99,20,EE,98,B5,3
1315 DATA C5,3,B0,11,20,D6,98,A1,0,C9
1320 DATA 22,90,5,F6,3,4C,7D,99,20,E2
1325 DATA 98,B5,2,C5,2,B0,11,20,EE,98
1330 DATA A1,0,C9,22,90,5,F6,2,4C,7D
1335 DATA 99,20,F5,98,A5,3,D5,3,B0,1A
1340 DATA 20,E2,98,A1,0,C9,22,B0,6,20
1345 DATA D6,98,4C,86,99,D6,3,C5,12
1350 DATA D0,3,85,F,60,95,4,A9,21,81
1355 DATA 0,E0,5,D0,5,A2,A,4C,2,99,A2
1360 DATA 3,DE,C8,BB,BD,C8,BB,C9,2F
1365 DATA D0,9,A9,39,9D,C8,BB,CA,4C
1370 DATA 95,99,60,A2,6,A0,20,A9,A5
1375 DATA 91,0,88,91,0,88,F0,8,A9,24
1380 DATA 91,0,88,4C,AD,99,CA,D0,1,60
1385 DATA 18,A5,00,69,A0,85,0,90,2,E6
1390 DATA 1,4C,A8,99,A2,15,A9,A5,A0,0
1395 DATA 91,0,48,98,18,65,2,A8,68,C4
1400 DATA 3,D0,F3,CA,D0,1,60,48,A5,0
1405 DATA 18,69,28,85,0,90,2,E6,1,68
1410 DATA 49,81,4C,D5,99,A9,FC,85,2
1415 DATA A9,BB,85,3,A0,0,B1,2,C9,13
1420 DATA D0,9,A5,4,A6,5,85,5,86,4,60
1425 DATA C5,4,D0,4,A5,5,91,2,E6,2,D0
1430 DATA 2,E6,3,4C,4,9A,A0,0,84,0,84
1435 DATA 2,84,3,A9,5,85,1,A5,9C,C5,0
1440 DATA D0,7,A5,9D,C5,1,D0,1,60,B1
1445 DATA 0,18,65,2,85,2,90,2,E6,3,E6
1450 DATA 0,D0,2,E6,1,4C,30,9A
1455 CLS:CALL#9A24
1460 PRINT"CHECKSUM",DEEK(2)
1465 PRINT:PRINT"PRESS ANY KEY"
1470 A$=KEY$:GETA$:CLS
2000 REM INSTRUCTIONS
2005 FORA=1TO2:PLOT12,A,CHR$(10)+CHR$(1)+"B R O O D":
NEXT
2010 PRINT:PRINT:PRINT:PRINT
2015 PRINT"By T.W.Phoeng "CHR$(96)" june 1984"
2020 PRINT:PRINT"You're inside an incubator in which"
2025 PRINT"eggs of the munzter are stored on a"
2030 PRINT"grid."
2035 PRINT"Your task is to destroy these eggs"
2040 PRINT"before they hatch."
2045 PRINT"An easy job if there hadn't been any"
2050 PRINT"brood-gridders coming after you."
2055 PRINT"Fortunately they can not leave the"
2060 PRINT"grid but they are able to get you"
2065 PRINT"when you come near the grid."
2070 PRINT"At any time you can freeze the brood-"
2075 PRINT"gridders with your z-ray. But as this"
2080 PRINT"also speeds up the hatching of the"
2085 PRINT"eggs, you should not use this weapon"
2090 PRINT"too often."
2095 PRINT"If time runs-out the eggs hatch and"
2100 PRINT"the young munzters will kill you with"
2105 PRINT"their radiation."
2110 PRINT:PRINT
2115 PRINT"PRESS ANY KEY";
2120 A$=KEY$:GETA$:CLS
2125 PRINT" "CHR$(137)"@"CHR$(136)". . . that's you"
2130 PRINT:PRINT" "CHR$(137)"!"CHR$(136)". . . brood gridder"
2135 PRINT:PRINT" "CHR$(137)" "CHR$(136)". . . egg"
2140 PLOT3,4,165
2145 PRINT:PRINT" "CHR$(137)"'"CHR$(136)". . . young
    munzter"
2150 PRINT:PRINT:PRINT
2155 PRINT"MOVEMENT CONTROL :"
2160 PRINT"the cursor-keys or a joystick (PASE"
2165 PRINT"interface, right port)"
2170 PRINT:PRINT"ON/OFF SWITCH OF Z-RAY :"
2175 PRINT"space bar or fire button"
2180 PRINT:PRINT:PRINT
2185 PRINT"JOYSTICK CONTROL (Y/N) ?"
2190 GETA$:IFA$="Y"THEN800
2195 IFA$<>"N"THEN2190
2200 PRINT:PRINT
2205 PRINT"INPUT SOUND LEVEL (0-15)";
2210 INPUTV
2215 IFV<0ORV>15THEN2210
2220 GOTO600
```

"I'M A TOSHIBA HX10
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BEST BITS FROM EVERY
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ANY OTHER NON-MSX
COMPUTER. AND I USE
MICROSOFT EXTENDED
BASIC, LIKE EVERY
OTHER MSX COMPUTER."

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COSMIC CAVERN IS a machine-code game for the Commodore 64, incorporating smooth scrolling techniques with flicker-free display, and can be played with a joystick or from the keyboard. Shoot as many aliens as possible while avoiding crashing your spaceship into them or the walls of the cavern. Use a joystick to control your spaceship or:

N for left, M to move right.
Commodore key to move down.
Control key to move up.
Shift key to fire.

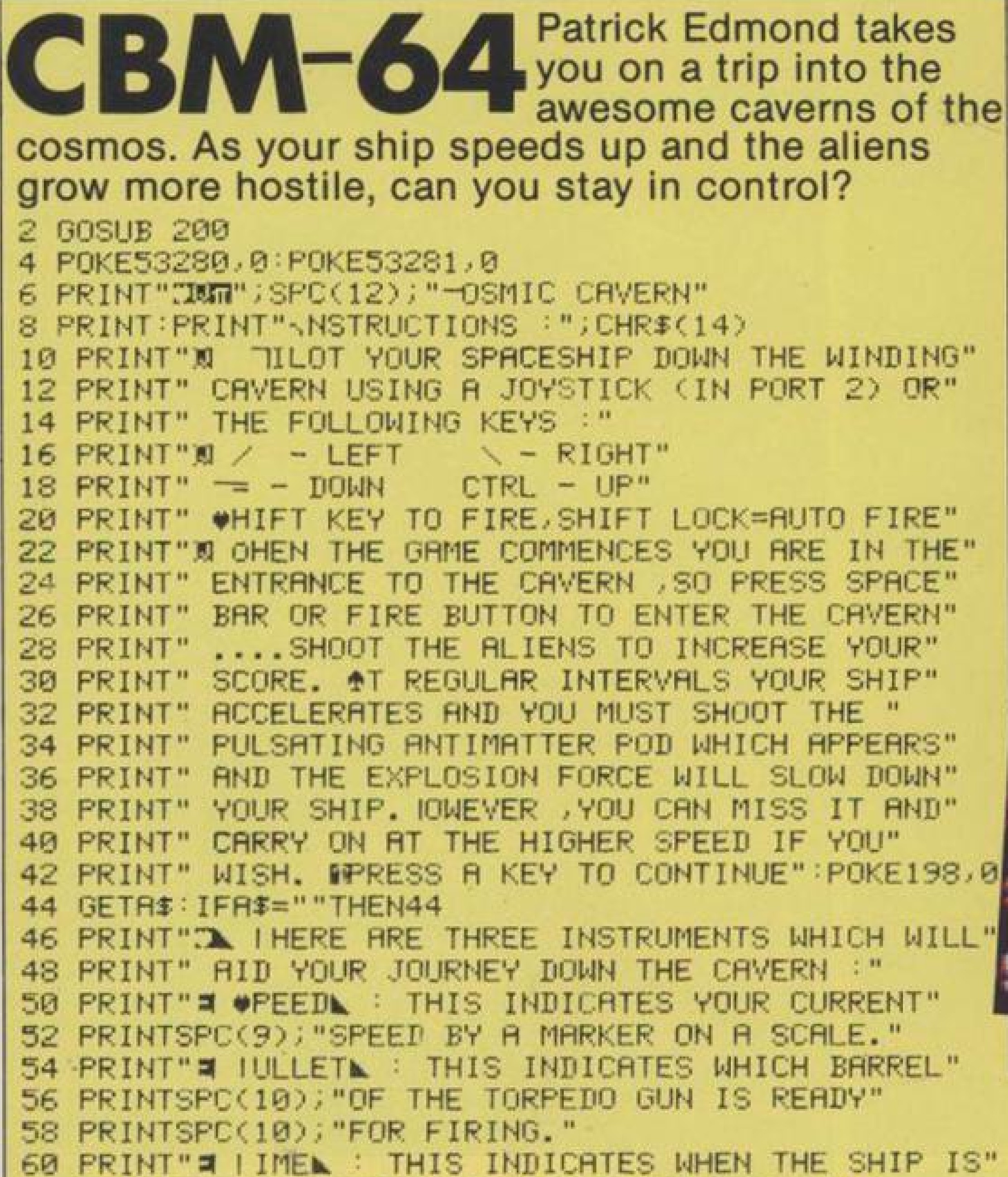
If you want to fire continuously, press the Shift Lock key rather than hold the fire button or Shift key down all the time.

At regular intervals your spaceship will accelerate by a factor of one, shown on the speed indicator. At the same time a square pulsating anti-matter pod will appear in the cavern. If you shoot it the resultant shock wave slows down your spaceship by a factor of one.

However, in practice you may miss the pod and remain on speed level 2 which is more difficult to steer through. Should you go past speed level 7, you will return to speed 1 and be awarded a massive 100,000 points, but if you reach speed level 4, for example, you will see how difficult it is to steer down the cavern at such high speed.

You are warned of the acceleration of your spaceship by the time indicator which counts down from right to left. The bullet indicator simply shows which of the seven torpedo barrels is to be fired next. The values of the various aliens are displayed on screen above the speed, bullet and time indicators.

Inevitably you will crash your spaceship, the computer will take over, showing all seven speed levels, and then stop. Press the fire button or space bar to return to the start, which will clear your score unless you attained the



CBM-64

Patrick Edmond takes you on a trip into the awesome caverns of the cosmos. As your ship speeds up and the aliens grow more hostile, can you stay in control?

```
2 GOSUB 200
4 POKE53280,0:POKE53281,0
6 PRINT"ЭЯ";SPC(12);"-OSMIC CAVERN"
8 PRINT:PRINT"\NSTRUCTIONS :";CHR$(14)
10 PRINT"Я  ЛILOT YOUR SPACESHIP DOWN THE WINDING"
12 PRINT" CAVERN USING A JOYSTICK (IN PORT 2) OR"
14 PRINT" THE FOLLOWING KEYS :"
16 PRINT"Я /  - LEFT      \ - RIGHT"
18 PRINT" ▔= - DOWN     CTRL - UP"
20 PRINT" ♥HIFT KEY TO FIRE,SHIFT LOCK=AUTO FIRE"
22 PRINT"Я OHEN THE GAME COMMENCES YOU ARE IN THE"
24 PRINT" ENTRANCE TO THE CAVERN ,SO PRESS SPACE"
26 PRINT" BAR OR FIRE BUTTON TO ENTER THE CAVERN"
28 PRINT" ....SHOOT THE ALIENS TO INCREASE YOUR"
30 PRINT" SCORE. ♠T REGULAR INTERVALS YOUR SHIP"
32 PRINT" ACCELERATES AND YOU MUST SHOOT THE "
34 PRINT" PULSATING ANTIMATTER POD WHICH APPEARS"
36 PRINT" AND THE EXPLOSION FORCE WILL SLOW DOWN"
38 PRINT" YOUR SHIP. IOWEVER ,YOU CAN MISS IT AND"
40 PRINT" CARRY ON AT THE HIGHER SPEED IF YOU"
42 PRINT" WISH. ▮PRESS A KEY TO CONTINUE":POKE198,0
44 GETA$:IFA$=""THEN44
46 PRINT"Э◣ IHERE ARE THREE INSTRUMENTS WHICH WILL"
48 PRINT" AID YOUR JOURNEY DOWN THE CAVERN :"
50 PRINT"Ⅎ ♥PEED◣ : THIS INDICATES YOUR CURRENT"
52 PRINTSPC(9);"SPEED BY A MARKER ON A SCALE."
54 PRINT"Ⅎ IULLET◣ : THIS INDICATES WHICH BARREL"
56 PRINTSPC(10);"OF THE TORPEDO GUN IS READY"
58 PRINTSPC(10);"FOR FIRING."
60 PRINT"Ⅎ IIME◣ : THIS INDICATES WHEN THE SHIP IS"
62 PRINTSPC(8);"ABOUT TO ACCELERATE AND WHEN"
64 PRINTSPC(8);"AN ANTIMATTER POD WILL APPEAR"
66 PRINTSPC(8);"(BOTH EVENTS OCCUR"
68 PRINTSPC(8);"SIMULTANEOUSLY)."
70 PRINT"Я IHE TIME READOUT IS THE MOST USEFUL OF"
72 PRINT" THESE INSTRUMENTS."
74 PRINT"  \F YOU REACH SPEED 7 AND ACCELERATE"
76 PRINT" AGAIN YOU WILL RETURN TO SPEED 1 AND"
78 PRINT" RECEIVE 100000 POINTS !"
80 PRINT" \F YOU CRASH,WAIT UNTIL THE SHIP STOPS"
82 PRINT" THEN PRESS SPACE BAR OR FIRE BUTTON TO"
84 PRINT" RETURN TO THE START."
86 PRINT"ЯⅎRESS A KEY TO START":POKE198,0
88 GETA$:IFA$=""THEN88
90 SYS18048
200 PRINT"ЭЯ ENTERING DATA,PLEASE WAIT"
```




```
202 I=16384
204 READA$:IFA$="*"THENRETURN
206 L=ASC(LEFT$(A$,1))-48
208 IFL>9THENL=L-7
210 R=ASC(RIGHT$(A$,1))-48
212 IFR>9THENR=R-7
214 POKEI,16*L+R:I=I+1:GOTO204
300 DATAA9,3F,8D,11,D0,A9,18,8D
302 DATA18,D0,A5,F4,F0,19,C6,F3
304 DATA10,10,A9,11,8D,04,D4,A9
306 DATA08,E5,FF,0A,0A,0A,85,F3
308 DATAD0,05,A9,00,8D,04,D4,AD
310 DATA12,D0,18,C9,B0,90,F8,A9
312 DATA1F,8D,11,D0,A9,18,8D,18
314 DATAD0,A9,00,8D,8E,02,A9,00
316 DATA85,F1,85,F0,85,EF,A5,F4
318 DATAD0,03,4C,78,43,20,9F,FF
320 DATAAE,8D,02,8A,29,01,85,F1
322 DATA8A,29,02,85,F0,8A,29,04
324 DATA85,EF,AD,00,DC,29,10,49
326 DATA10,05,F1,85,F1,A5,C5,C9
328 DATA27,F0,07,AD,00,DC,29,04
330 DATAD0,0E,AD,00,D0,38,E5,FF
332 DATA8D,00,D0,B0,03,CE,10,D0
```

high score, and press fire button or spacebar again to commence journey into the cavern.

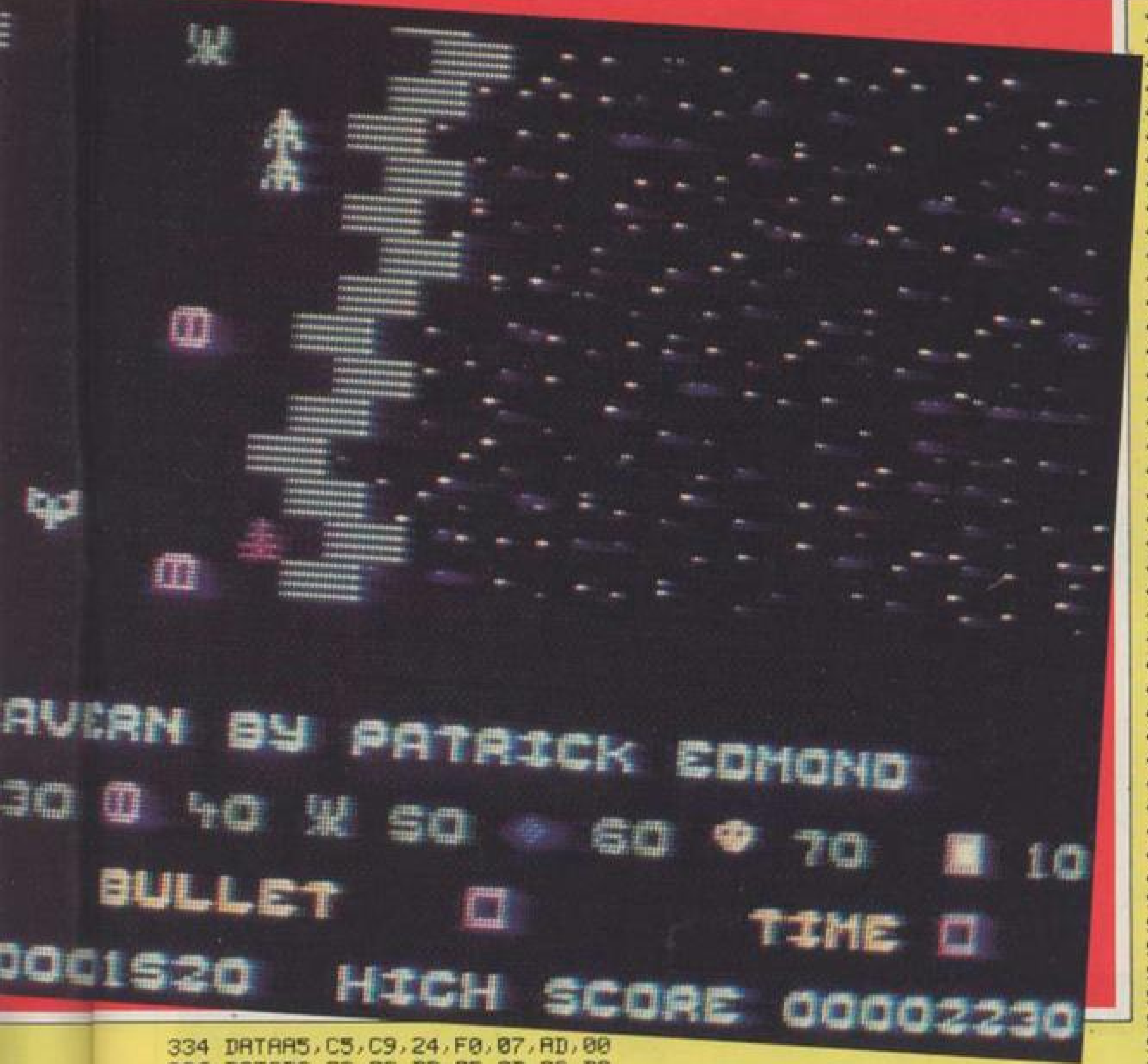
Cosmic Cavern can be typed in exactly as shown and Saved. However, if you own an assembler, type in lines 4 to 90 and add:

2 C=C+1:IFC=1THEN LOAD"",1,1

and Save on cassette. Next enter the hex code of lines 900 to 904 directly into memory with your assembler beginning at 4000 hex, and Save 4000 to 4980 hex on cassette after the shortened Basic program just mentioned. Typing Cosmic Cavern in this way avoids the delay associated with the subroutine at line 200

(continued on page 103)

COSMIC CAVERN




```
334 DATAA5,C5,C9,24,F0,07,AD,00
336 DATADC,29,08,D0,0E,AD,00,D0
338 DATA18,65,FF,8D,00,D0,90,03
340 DATAEE,10,D0,AD,01,D0,C9,36
342 DATAF0,11,A5,EF,D0,07,AD,00
344 DATADC,29,01,D0,06,CE,01,D0
346 DATACE,01,D0,AD,01,D0,C9,94
348 DATAF0,11,A5,F0,D0,07,AD,00
350 DATADC,29,02,D0,06,EE,01,D0
352 DATAEE,01,D0,C6,FA,10,08,A9
354 DATA05,85,FA,A5,F1,D0,03,4C
356 DATA60,41,C6,FB,10,04,A9,06
358 DATA85,FB,A5,FB,A8,0A,AA,AD
360 DATA01,D0,9D,03,D0,AD,00,D0
362 DATA9D,02,D0,A9,01,0A,88,10
364 DATAFC,A8,49,FF,2D,10,D0,8D
366 DATA10,D0,AD,10,D0,29,01,F0
368 DATA07,98,0D,10,D0,8D,10,D0
370 DATAA9,04,95,E1,AD,00,D0,4A
372 DATA4A,4A,38,E9,02,95,E0,B0
374 DATA02,D6,E1,AD,10,D0,29,01
376 DATAF0,0B,B5,E0,18,69,20,95
378 DATAE0,90,02,F6,E1,AD,01,D0
380 DATA38,E9,32,29,F8,A8,18,75
382 DATAE0,95,E0,90,02,F6,E1,98
384 DATA0A,18,0A,90,02,F6,E1,18
386 DATA75,E0,95,E0,90,02,F6,E1
388 DATAA5,FA,A2,06,9D,28,D0,CA
390 DATA10,FA,A2,00,B5,E1,F0,38
392 DATA85,F9,B5,E0,85,F8,A0,00
394 DATAB1,F8,F0,03,4C,37,43,A0
396 DATA28,B1,F8,D0,F7,BD,03,D0
398 DATA18,69,08,9D,03,D0,18,C9
400 DATAA0,90,0A,A9,00,9D,03,D0
402 DATA95,E1,4C,A8,41,B5,E0,18
404 DATA69,28,95,E0,90,02,F6,E1
406 DATAE8,E8,E0,0E,D0,BE,A5,F4
408 DATAF0,1B,A5,F1,D0,08,A9,20
410 DATA8D,0B,D4,4C,C3,41,A9,21
412 DATA8D,0B,D4,A5,F8,4A,4A,4A
414 DATA09,20,8D,08,D4,A9,00,85
416 DATAF9,A5,FE,38,E5,FF,29,07
418 DATA85,FE,90,03,4C,1F,43,A9
420 DATA04,8D,FF,41,8D,02,42,A9
422 DATA28,8D,FE,41,A9,00,8D,01
424 DATA42,8D,04,42,A9,D8,8D,05
426 DATA42,A0,0F,A2,27,BD,58,06
428 DATA9D,30,06,9D,30,DA,CA,10
430 DATAF4,88,F0,2C,C0,06,D0,03
432 DATA20,2F,43,AD,01,42,18,69
434 DATA28,8D,01,42,8D,04,42,90
436 DATA06,EE,02,42,EE,05,42,AD
438 DATAFE,41,18,69,28,8D,FE,41
440 DATA90,03,EE,FF,41,4C,FB,41
442 DATAAD,1B,D4,29,01,F0,0B,A5
444 DATAFD,C9,19,F0,0B,E6,FD,4C
446 DATA50,42,A5,FD,F0,02,C6,FD
448 DATAA9,00,A2,27,9D,58,06,CA
450 DATA10,FA,A6,FD,A9,0D,9D,58
452 DATA06,9D,59,06,9D,65,06,9D
454 DATA66,06,CA,30,0B,AD,1B,D4
456 DATA29,07,9D,58,06,CA,10,F5
458 DATAA5,FD,18,69,0F,AA,AD,1B
460 DATAD4,29,07,9D,58,06,E8,E0
462 DATA29,D0,F3,AD,1B,D4,29,1F
464 DATA18,C9,0A,B0,10,18,65,FD
466 DATAAA,E8,E8,AD,1B,D4,29,07
468 DATA69,10,9D,58,06,A5,F4,F0
470 DATA35,C6,F2,D0,31,A9,80,85
472 DATAF2,A5,FD,69,06,AA,A9,09
474 DATA9D,58,06,A6,FF,E8,8A,29
476 DATA07,85,FF,E0,08,D0,17,A2
478 DATA02,FE,A3,07,BD,A3,07,C9
480 DATA3C,D0,09,A9,32,9D,A3,07
482 DATACA,4C,C9,42,E6,FF,A6,FF
484 DATABD,40,44,8D,22,D0,A5,F4
486 DATAD0,17,A5,FD,18,69,0A,0A
488 DATA0A,0A,8D,00,D0,AD,10,D0
490 DATA29,FE,90,02,09,01,8D,10
492 DATAD0,CE,23,D0,AD,11,D0,29
494 DATA7F,8D,11,D0,A9,A8,8D,12
496 DATAD0,AD,19,D0,09,81,8D,19
498 DATAD0,68,A8,68,AA,68,40,A2
500 DATA04,A0,C0,88,D0,FD,CA,D0
502 DATAF8,20,2F,43,4C,DE,42,A9
504 DATA10,05,FE,8D,11,D0,60,C9
506 DATA09,D0,0B,A5,FF,C6,FF,D0
508 DATA02,E6,FF,4C,56,43,C9,0D
510 DATAD0,0A,A9,00,9D,03,D0,95
512 DATAE1,4C,A8,41,29,EF,85,F7
514 DATAA9,00,91,F8,A9,03,8D,13
516 DATAD4,A9,05,8D,14,D4,A9,81
518 DATA8D,12,D4,A9,0F,8D,18,D4
520 DATAA9,80,8D,12,D4,4C,A8,41
522 DATAA2,80,CA,D0,FD,4C,D1,41
524 DATA10,10,00,3C,F0,00,33,30
526 DATA00,33,30,00,3F,F0,00,0F
528 DATAC0,00,03,00,00,03,00,00
530 DATA00,00,00,00,00,00,00,00
532 DATA00,00,00,00,00,00,00,00
534 DATA00,00,00,00,00,00,00,00
536 DATA00,00,00,00,00,00,00,00
538 DATA00,00,00,00,00,00,00,00
540 DATA01,00,00,02,00,00,01,00
542 DATA00,02,00,00,01,00,00,02
544 DATA00,00,01,00,00,02,00,00
546 DATA01,00,00,02,00,00,01,00
548 DATA00,02,00,00,01,00,00,00
550 DATA00,00,00,00,00,00,00,00
552 DATA00,00,00,00,00,00,00,00
554 DATA00,00,00,00,00,00,00,00
556 DATA00,00,00,00,00,00,00,00
```

(listing continued on page 103)

Stay cool. Stay low. Stay alive.

RIVER RAID

1-2 Players. Running on
Commodore 64, Sinclair Spectrum
from your usual software store.

You are commanding a squadron of four ground attack aircraft...

The mission is seemingly hopeless.

Fly along the river at zero altitude, twisting and turning crazily to stay within its tortuous banks, blasting at anything and everything in sight. Especially the bridges.

Three of your jets are held in reserve while you are pitched against Battleships, Enemy Aircraft, Land Tanks, Balloons, Helicopter Gunships. All intent only on your destruction.

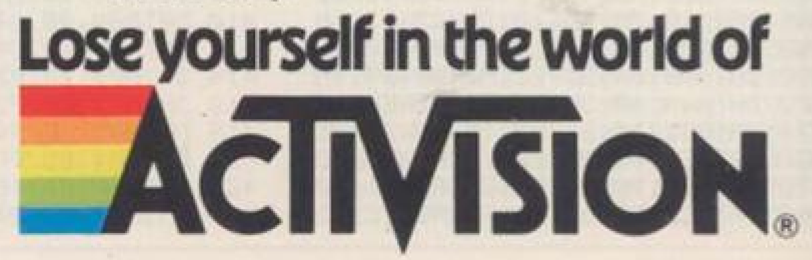
And destroy you they will, if you don't get them first. You'll need to keep an eye on your fuel gauge. But take comfort, you can take fuel on board from one of the special depots.

If you get hit – and nobody has yet reached the end of the river – your next reserve starts at the last bridge you blasted on your way through!

Each target you destroy adds to your points score.

Like all Activision Software, River Raid will hold you and keep you coming back for more.

Chocks away!



(continued from page 101)
every time you play the game, but if you don't own an assembler I'm afraid that every time you load Cosmic Cavern you will have to endure this delay while the Basic subroutine enters the data into memory. Please check carefully that the hex code has been entered correctly before running.

The heart of the program is an interrupt routine located at 4000 hex to 4380. In Cosmic Cavern all interrupt sources, such as the timer chips, are disabled except for the raster interrupt. The raster scan is controlled by the '64 transfers the screen memory on to the television from top to bottom every 1/60th of a second, and the process takes about 1/60th of a second.

The raster position can be found in locations D011 and D012 hex, and in Cosmic Cavern a latch is set so that an interrupt request is generated when the raster scan is about half way down the screen. This is explained in the programmer's reference guide. When this interrupt occurs the routine at 4000 hex commences, the '64 is set into 25 row mode so that the score and instruments are held stationary, the spaceship is moved according to joystick or keyboard and any bullets are moved down the screen.

Finally, the cavern is shifted up the screen by one bit — since smooth scrolling is involved the cavern is only moved a fraction of a whole character up the screen — multiplied by the spaceship speed, and the scroll position is updated in register D011 hex. If this movement exceeds seven bits the screen memory is shifted up one whole character and the cavern wall blocks and starts are added on to the bottom of the existing cavern. By now the raster has completed a scan, so return to the top of the screen; the 64 is set in 24-row mode so that the smooth scroll position, lower three bits of D011 hex, takes effect and completes the interrupt.

Speed, bullet and time

The program running under this interrupt is responsible for the speed bullet and time instruments and also waits for the spaceship to collide with an alien or cavern walls — sprite to background collision detector D01F hex — if a collison does occur this program takes over control of the spaceship producing the crash effect and then resets for another game.

A cassette is available containing two copies of Cosmic Cavern for £3.00 including postage and packing.

Send a cheque or postal order to Patrick Edmond, "Le Nid", Scarborough Road, Driffield, East Yorks, YO25 7EQ. ■

(listing continued from page 101)

```
558 DATA00,00,00,00,00,00,03,00
560 DATA00,00,00,30,00,00,00,00
562 DATA01,00,00,00,00,00,00,00
564 DATA00,00,60,00,00,00,00,00
566 DATA00,00,00,00,00,00,00,30
568 DATA60,00,00,00,00,00,00,00
570 DATA00,30,00,00,00,00,00,00
572 DATA00,07,06,05,03,01,0B,02
574 DATAAA,AA,BE,BE,BE,BE,AA,AA
576 DATA00,00,00,00,00,00,00,00
578 DATAFF,FF,FF,AA,FF,FF,FF,AA
580 DATAFF,FF,D7,D7,D7,D7,FF,FF
582 DATAFF,55,FF,55,FF,55,FF,55
584 DATA00,00,00,00,00,00,00,00
586 DATA00,00,00,00,00,00,00,00
588 DATA00,00,00,00,00,00,00,00
590 DATA18,3C,7E,C3,C3,7E,66,E7
592 DATA18,3C,18,7E,18,FF,18,FF
594 DATA18,18,3C,7E,5A,7E,DB,DB
596 DATA7E,FF,DB,DB,DB,DB,FF,7E
598 DATAC3,DB,DB,DB,7E,3C,7E,DB
600 DATA00,10,38,7C,FE,7C,38,10
602 DATA3C,FF,DB,FF,7E,3C,00,00
604 DATA00,7C,FE,C6,C6,FE,C6,C6
606 DATA00,FC,FE,C6,FE,C6,FE,FC
608 DATA00,7C,FE,C0,C0,C0,FE,7C
610 DATA00,FC,FE,C6,C6,C6,FE,F
612 DATA00,FC,FE,C0,F0,C0,FE,F
614 DATA00,FC,FE,C0,F0,C0,C0,C6
616 DATA00,7C,FE,C0,C0,C6,FE,7C
618 DATA00,C6,C6,C6,FE,C6,C6,C6
620 DATA00,3C,FE,18,18,18,FE,3C
622 DATA00,00,00,00,00,66,66,0
624 DATA00,C0,C6,CC,F8,CC,C6,C
626 DATA00,C0,C0,C0,C0,C0,FE,F
628 DATA00,C6,EE,FE,D6,C6,C6,C6
630 DATA00,C6,E6,F6,DE,CE,C6,C6
632 DATA00,7C,FE,C6,C6,C6,FE,7C
634 DATA00,7C,FE,C6,FE,FC,C0,C0
636 DATA00,7C,FE,C6,C6,CC,FE,76
638 DATA00,7C,FE,C6,FE,FC,C6,C6
640 DATA00,7C,FE,C0,7C,06,FE,7C
642 DATA00,7C,FE,18,18,18,18,18
644 DATA00,C6,C6,C6,C6,C6,FE,7C
646 DATA00,C6,C6,C6,C6,6C,7C,38
648 DATA00,C6,C6,D6,D6,FE,FE,7C
650 DATAFC,C0,FC,0D,FF,06,0C,18
652 DATA00,C6,C6,E6,7E,06,FE,7C
654 DATA30,60,C0,83,C3,DB,DB,FF
656 DATA00,7C,FE,C6,C6,C6,FE,7C
658 DATA00,18,38,18,18,18,18,3C
660 DATA00,7C,FE,06,0C,30,FE,7C
662 DATA00,7C,FE,06,1E,06,FE,7C
664 DATA00,60,60,6C,7E,0C,0C,0C
666 DATA00,7C,FE,C0,FC,06,FE,7C
668 DATA00,7C,FE,C0,FC,C6,FE,7C
670 DATA00,7C,FE,0C,0C,18,18,18
672 DATA00,7C,FE,C6,FE,C6,FE,7C
674 DATA00,7C,FE,C6,FE,06,FE,7C
676 DATA11,00,33,32,00,12,00,34
678 DATA32,00,13,00,35,32,00,14
680 DATA00,36,32,00,15,00,37,32
682 DATA00,16,00,38,32,00,17,00
684 DATA39,32,00,00,09,00,33,32
686 DATA2A,27,1C,1C,1B,00,0C,0C
688 DATA0C,0C,0C,0C,0C,00,00,19
690 DATA2C,23,23,1C,2B,00,0C,0C
692 DATA0C,0C,0C,0C,0C,00,00,2B
694 DATA20,24,1C,00,0C,0C,0C,0C
696 DATA30,26,2C,29,00,2A,1A,26
698 DATA29,1C,00,32,32,32,32,32
700 DATA32,32,32,00,00,1F,20,1E
702 DATA1F,00,2A,1A,26,29,1C,00
704 DATA32,32,32,32,32,32,32,32
706 DATA00,00,00,00,1A,26,2A,24
708 DATA20,1A,00,1A,18,2D,1C,29
710 DATA25,00,19,30,00,27,18,2B
712 DATA29,20,1A,22,00,1C,1B,24
714 DATA26,25,1B,00,00,00,00,00
716 DATA78,A9,40,8D,15,03,A9,00
718 DATA8D,14,03,8D,20,D0,8D,21
720 DATAD0,A9,43,8D,19,03,A9,1E
722 DATA8D,18,03,A9,00,8D,0E,DD
724 DATA8D,0E,DC,8D,11,D0,A2,00
726 DATAA9,00,9D,00,04,9D,00,05
728 DATA9D,00,06,9D,00,07,9D,00
730 DATAD8,9D,00,D9,9D,00,DA,9D
732 DATA00,DB,E8,D0,E5,A9,00,9D
734 DATA00,D0,E8,E0,11,D0,F8,A2
736 DATA06,A9,21,9D,F9,07,CA,10
738 DATAFA,A9,36,8D,01,D0,A9,A0
740 DATA8D,00,D0,A9,FF,8D,15,D0
742 DATAA9,20,8D,F8,07,A2,80,BD
744 DATA80,43,9D,00,08,CA,10,F7
746 DATAA9,0D,8D,27,D0,A2,1F,A9
748 DATA00,95,E0,CA,10,FB,A9,00
750 DATA85,FF,A9,0A,85,FD,A9,FF
752 DATA8D,1C,D0,8D,25,D0,A9,03
754 DATA8D,26,D0,A9,07,8D,22,D0
756 DATA8D,23,D0,A9,28,85,A9,A0
758 DATA00,84,A8,98,91,A8,C8,D0
760 DATAFB,E6,A9,A5,A9,C9,40,D0
762 DATAF2,A9,34,8D,01,D4,8D,03
764 DATAD4,A9,07,8D,0C,D4,A9,61
766 DATA8D,0D,D4,8D,07,D4,8D,00
768 DATAD4,A9,81,8D,12,D4,A9,8F
770 DATA8D,18,D4,A9,FA,8D,0E,D4
772 DATA8D,0F,D4,A9,0F,8D,13,D4
774 DATA8D,14,D4,A9,00,8D,05,D4
776 DATA8D,06,D4,A9,D8,8D,16,D0
778 DATAA9,80,85,F2,A9,FF,8D,91
780 DATA02,A2,00,BD,00,44,9D,00
782 DATA20,BD,00,45,9D,00,21,E8
784 DATAD0,F1,A2,27,BD,E0,45,9D
786 DATAF8,06,BD,58,46,9D,A8,06
788 DATABD,08,46,9D,48,07,BD,30
790 DATA46,9D,98,07,A9,03,9D,A8
792 DATADA,9D,98,DB,A9,07,9D,48
794 DATADB,A9,05,9D,F8,DA,CA,10
796 DATAD3,A9,09,8D,1C,DB,A2,00
798 DATAA0,01,98,9D,F8,DA,8A,18
800 DATA69,05,AA,C8,C0,08,D0,F2
802 DATAA9,00,85,A8,AA,A9,04,85
804 DATAA9,A0,0B,A9,0B,91,A8,A0
806 DATA18,91,A8,A5,A8,18,69,28
808 DATA85,A8,90,02,E6,A9,E8,E0
810 DATA10,D0,E6,A9,0B,A2,00,9D
812 DATA00,D8,9D,00,D9,E8,D0,F7
814 DATA9D,00,DA,E8,E0,58,D0,F8
816 DATAA9,81,8D,1A,D0,AD,1F,D0
818 DATAA9,18,8D,18,D0,A9,A8,8D
820 DATA12,D0,A9,10,8D,11,D0,AD
822 DATA19,D0,09,81,8D,19,D0,A9
824 DATAFF,85,F4,58,AD,00,DC,29
826 DATA10,F0,07,AD,01,DC,29,10
828 DATAD0,F2,A9,01,85,FF,AE,25
830 DATAD0,E8,8A,29,03,8D,25,D0
832 DATAA2,06,A5,F7,F0,18,FE,A3
834 DATA07,BD,A3,07,C9,3C,F0,05
836 DATAC6,F7,4C,50,48,A9,32,9D
838 DATAA3,07,CA,4C,56,48,A2,07
840 DATAA9,08,9D,4E,DB,CA,10,FA
842 DATAA9,0C,A6,FF,9D,4D,DB,A9
844 DATAA0,A2,A6,9D,5E,DB,CA,10
846 DATA[illegible]
848 DATA9D,5E,DB,A5,FF,18,69,32
850 DATA8D,1E,07,A2,05,A9,08,9D
852 DATA6C,DB,CA,10,FA,A5,F2,4A
854 DATA4A,4A,4A,4A,AA,A9,0C,9D
856 DATA6C,DB,AD,1F,D0,29,01,D0
858 DATA03,4C,46,48,A2,00,86,F4
860 DATAA9,1F,8D,05,D4,A9,8F,8D
862 DATA06,D4,8D,01,D4,8D,00,D4
864 DATAA2,40,A9,81,8D,04,D4,A9
866 DATA01,8D,15,D0,A9,21,8D,0B
868 DATAD4,A0,FF,88,D0,FD,A9,80
870 DATA8D,04,D4,A9,20,8D,0B,D4
872 DATA8A,4A,8D,08,D4,8D,01,D4
874 DATAAD,01,D0,18,C9,96,B0,03
876 DATAEE,01,D0,A0,FF,88,D0,FD
878 DATACA,D0,C7,A5,FF,C9,07,F0
880 DATA05,E6,FF,4C,D0,48,A9,00
882 DATA8D,10,D4,A9,81,8D,04,D4
884 DATAA9,04,8D,01,D4,A9,80,8D
886 DATA04,D4,A2,07,A0,FF,86,FF
888 DATA88,D0,FB,C6,FA,D0,F5,A9
890 DATA60,85,FA,CA,D0,EE,A9,00
892 DATA85,FF,A2,00,BD,A3,07,18
894 DATADD,B8,07,D0,08,E8,E0,08
896 DATAD0,F2,4C,62,49,90,0B,A2
898 DATA07,BD,A3,07,9D,50,46,CA
900 DATA10,F7,AD,01,DC,29,10,F0
902 DATA07,AD,00,DC,29,10,D0,F2
904 DATA4C,80,46,00,00,00,00,00
906 DATA*

READY.
```



And cwikey! i

First we jolly well put everything you need to start home computing into one box.

Then we placed an obligingly low price on it all: under £140 for a computer, cassette unit, a super programming course and 4 great games programs.

Boys and girls (of all ages) will just love the Commodore 16 Starter Pack!

The computer has a 16K memory, real type-writer keyboard, 121 colours and also superb sound and graphics.

It uses BASIC (this is the language in which you and the computer "talk" to each other, right-ho?)

The BASIC used by the Commodore 16 is very advanced, yet really simple to use. This is because it gives you more programming commands.

But just in case any of you fellows do have any

ALLDERS · ARGOS · ASDA · BOOTS · BRITISH HOME STORES · CARREFOUR · CLYDESDALE · COMET · CO-OP · CURRYS · DIXONS · GRANADA · GREENS · LASKYS · JOHN LEWIS

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LEWIS

it's only £139.99.

difficulties, we also provide you with a Help key.

This helps to sort out programming errors by showing you exactly where you went wrong.

So you can get more out of your Commodore 16, the Starter Pack also includes "Introduction to BASIC," a guide to programming that any silly chump can follow.

And so you can get more enjoyment, there are four jolly good and splendidly challenging games: X-Zap, Punchy, Picture Builder and Chess.

If you are thinking of starting home computing, there has never been a better time than now, with the Commodore 16 Starter Pack.

No matter what age you are, old thing.



MAKRO · MENZIES · RUMBELOWS · SAVACENTRE · SPECTRUM · SUPREME · TESCO · WALLACE HEATON · W.H.SMITH · WOOLWORTH · AND NATIONAL NETWORK OF COMMODORE DEALERS

ZOOM IS AN easy to use machine-code utility and allows the user to enlarge to full screen size the area of the screen enclosed within a window. This window can be varied in size from 8-256 pixels wide and from 3-192 pixels high. When in Magnify mode the magnified area can be viewed continuously as the window is moved. Since the magnified area can also itself be magnified, using the same window, infinite magnification is possible, even if of doubtful use. The routine does not magnify the colour but produces the magnification in the current permanent attribute colour.

The routine accesses various Basic variables for its parameters. This means you do not have to bother Poking any numbers, but just use a Let statement. If you call the routine without having assigned the following variables a "2 Variable not found" error will be given.

The machine code has comprehensive error checking. Zoom will not allow XPOS or YPOS to be values that make a part of the window off screen. If say, XPOS was 270, an illegal screen co-ordinate, Zoom would give XPOS a new value that ensured that the window was entirely on the screen, this value would vary with the size of the window. The width of the window can have values between 0 and 5, the depth can have values between 0 and 6. If the variables Width or Depth have values that are too big Zoom will change the value to the maximum permissible value. Likewise if either has a negative value Zoom will replace the value with 0. The width and depth numbers correspond to the following window sizes:

	Width	Depth
0	256 Pixels	192 Pixels
1	128	96
2	64	48
3	32	24
4	16	12
5	8	6
6	—	3

Thus to have a window size 64 pixels by 12 pixels, Width would be 2 and depth would be 4. If you wish to see an example of Zoom error correcting, load up with the Zoom code and then run the following lines of Basic.

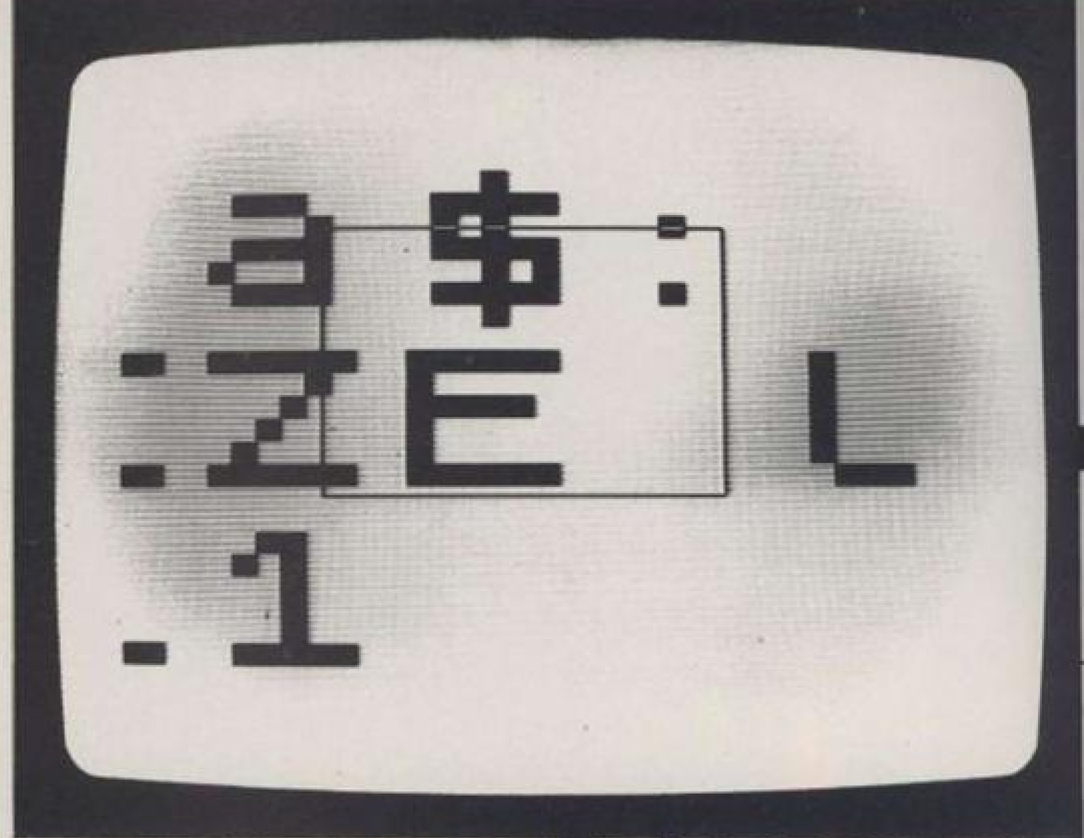
```
10 LET XPOS = 260: LET YPOS = - 10
20 LET WIDTH = 6: LET DEPTH = - 5
```

Having run the program type

```
RAND USR 50000
```

This will draw the Zoom window. In this case you will see a very tall, thin window. If you now type Print XPOS, YPOS, Width, Depth you will find that Width = 5, Depth = 0, XPOS = 248 and YPOS = 192. Since XPOS and YPOS denote the top left corner of the window, YPOS has been made 192 since the window is 192 pixels high i.e., this is the first value of YPOS above −10 that allows the window to appear/sit on the screen. XPOS has been rounded down until the window is on the screen, in this case 256-window width.

The algorithm used for Zoom takes each line of the window, places it in a buffer and keeps on doubling it in width until it is 32 bytes wide. It then puts the 32-byte buffer down on the screen — 192/(window y size) — times. The initial form of the screen is saved at 32768 and the magnified image is formed on the normal screen ie., at 16384. To create Zoom, type in program A and then save it. Now try running it, if you have no errors, then save the code. The code can be used independently of program B, this program is provided to help you use Zoom.



Basic program commands.

A ... Clear main screen and back-up.
B ... Move back-up screen down to current window screen.
L ... Load with new back-up screen.
m ... Magnify area under window until next key press.
M ... Continuously magnify. View can be moved around using normal direction keys.
N ... Retrieve back-up screen.
P ... Make magnified image current window screen.
s ... Alter window movement step size.
x ... Increase window width.
X ... Decrease window width.
y ... Increase window depth.
Y ... Decrease window height.

Machine-code routines.

Address	
30000	XOR current window onto screen. Doing this twice will delete the window
30003	Move screen from 32768 to 16384
30011	Move screen from 16384 to 32768
30019	Move screen from 39680 to 16384
30027	Move screen from 16384 to 39680
30039	Magnify area under window

The area 50708-50800 is used as work-space by Zoom and should be left clear.
32768-39679 Used to store screen during magnification.
39680-46591 Used to store back-up screen

Program A.

```
  10 DATA "c373c421008011004018162100401100801800e21009b110040180
62100401100 9b01001bedb0c9cd09c53a6f5c57210058010003722300b78b120f93a56c64f06003ec00491 30fc0578325
9c63a55c6f5a720043e201807cb3fcb3fcb3f3c3258c6f106ff"
  11 DATA 12409
  20 DATA "04fe002880387 18f878325
7c6ed4b53c6cdd7c4325ac63e408467eb2100403a56c647c5d5e5cd02c4d13a5
9c647c5d52113c6012000edb0e1cd64c4ebc110eee1cd64c4ebc110db3a58c64
f0600c9cd46c43a57c647a7c8c52113c61133c6010010c57ee5"
  21 DATA 13621
  30 DATA "6169a7280f060817f5cb15cb14f1cb15cb1410f3eb7223732 3ebe
123c110de2133c61113c6012000edb0c110c6c9eb3a58c64f1113c60600edb03
a5ac6a7c806202132c6cb162b10fb3d18f1243e07a4c07dc6206fd87cd60867c
9cd09c5ed4b53c6cdd7"
  31 DATA 13675
  40 DATA "c41eff16000e80a7472808cb3bcb1acb3910f8e5c5cdb8c4cb213
0030e012b3a56c6cdaec4c1e13a56c63dcdaec4cdb8c4c9477ea977cd64c410f
8c93a55c6a7200406201807cb3fcb3fcb3f477eab772ccb7b20037eaa7710f3c
93ec0c3ac222a5d5ce5"
  41 DATA 14484
  50 DATA "ed535d5ccdb228da2e1c2
3cdb433e1225d5cc978706f733d79706f733d6465707468 3d77696474683d110
3c5cddcc4cda22d7930043e05180b2803af1806fe06380a3e05f51103c5cde0c
5f15f16002106c6197e3255c611fdc4cddcc4cda22d7930043e"
  51 DATA 13530
  60 DATA "06180c28003af1807fe07da5bc53e06f511fdc4cde0c5f15f16002
10cc6197e3256c611f8c4cddcc4cda22d30003012c0128003010000c5e13a56c63
c5f1600ed523009d57b11f8c4cde0c5c1c5e111c100ed52380a1bd57b11f8c4c
de0c5c179f511f3c4cd"
  61 DATA 13805
  70 DATA "dcc4cda22d28051100001
81d3003012c01c5e13a55c6a72005110000180b573e00925f1600ed523809d57
b11f3c4cde0c5c1e1692253c6c92a5d5ce5ed535d5ccd282dcdb228fd3637003
003c32e1c224d5ced43725ce1225d5ccdff2ac90080402010 08"
  71 DATA 13307
  80 DATA "c06030180c0603"
  81 DATA 801
5000 LET f=50000
5010 FOR h=1 TO 8: READ a$
5011 LET c=0
5020 FOR s=1 TO LEN a$ STEP 2
5030 LET a=CODE a$(s): LET b=CODE a$(s+1)
5040 LET c=c+b+a
5050 IF a>96 THEN LET a=a-39
```

ZOOM ZOOM ZOOM ZOOM

Mark Jones takes you up, up and away . . . with his instant enlarger for the bleary-eyed Spectrum.

Variables.	
XPOS	X co-ordinate of window
YPOS	Y co-ordinate of window
WIDTH	Width of window 0-5
DEPTH	Depth of window 0-6

```
5060 IF b>96 THEN LET b=b-39
5070 LET a=a-48
5080 LET b=b-48
5090 POKE f,a*16+b
5100 LET f=f+1
5110 NEXT s
5111 PRINT "Line ";h*10;" is O.K
."
5120 READ tot: IF tot<>c THEN PR
INT "Error at line ";h*10: STOP
5125 LET c=0
5130 NEXT h
5140 PRINT "No Errors"
5150 PRINT "Save code from addre
ss 50000,   length 700 bytes."
```

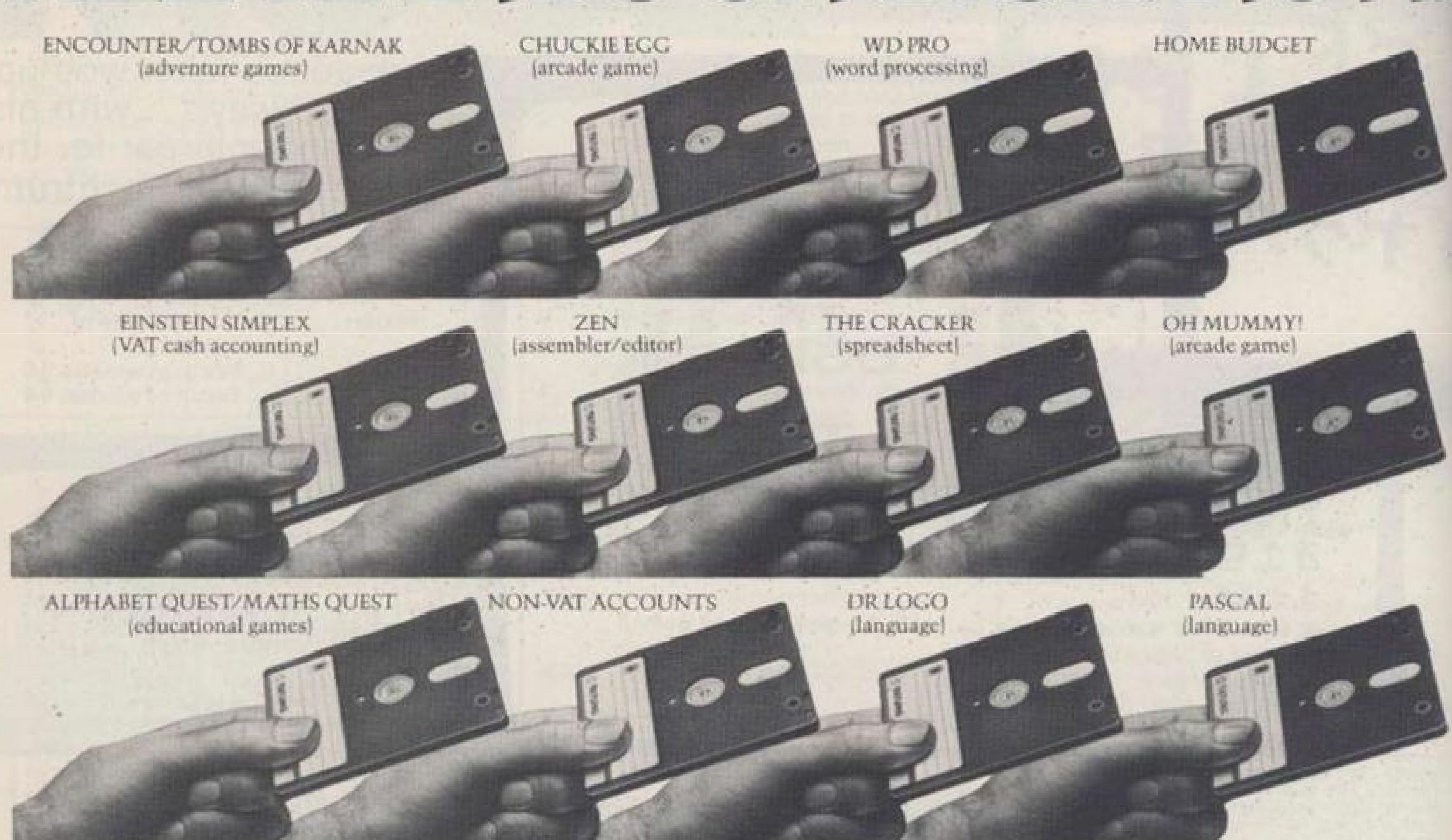
Program B. Demonstrates how little external control the machine code needs.

```
   5 LET width=1: LET depth=1
  10 LET xpos=100: LET ypos=100
  25 LET a=1
  30 LET mod=0
  40 LIST 1500: REM Put somethin
g on the screen
 100 GO SUB 1500
 110 IF INKEY$="" THEN GO TO 110
 115 IF NOT mod THEN RANDOMIZE U
SR 50000
 120 GO SUB 1000
 140 GO TO 100
 500 REM ********************
1000 LET tot=xpos+ypos
1005 LET xpos=xpos+a*((INKEY$="8
")-(INKEY$="5"))
1010 LET ypos=ypos+a*((INKEY$="7
")-(INKEY$="6"))
1020 IF xpos+ypos<>tot THEN RETU
RN
1025 REM ********************
1030 RANDOMIZE USR 50011: REM
   (save screen temporarily.)
1040 LET depth=depth+(INKEY$="Y"
)-(INKEY$="y")
1050 LET width=width+(INKEY$="X"
)-(INKEY$="x")
1070 IF INKEY$="m" THEN RANDOMIZ
E USR 50039: PAUSE 0: PAUSE 0
1075 IF INKEY$="M" THEN LET mod=
1-mod: GO SUB 1400
1080 IF INKEY$="A" THEN INPUT "C
onfirm Y/n ? ";a$: IF a$="Y" THE
N CLS : RANDOMIZE USR 50027: RAN
DOMIZE USR 50011
1085 IF INKEY$="P" THEN RANDOMIZ
E USR 50039: RANDOMIZE USR 50011
1090 IF INKEY$="N" THEN RANDOMIZ
E USR 50019: RANDOMIZE USR 50011
: LET mod=0
1100 IF INKEY$="s" THEN INPUT "S
tep size ? ";a: IF a<1 OR a>255
THEN GO TO 1100
1101 REM ********************
1102 REM Use  one  or  other  of
 these two versions.
1103 REM ********************
1104 REM   Microdrive Version
1105 IF INKEY$="L" THEN INPUT "s
creen to be loaded ? ";a$: IF a$
<>"" THEN LOAD *"m";1;a$CODE 396
80: RANDOMIZE USR 50019: RANDOMI
ZE USR 50011
1106 REM ********************
1107 REM   Tape Version
1108 IF INKEY$="L" THEN INPUT "s
creen name ? ";a$: IF a$<>"exit"
 THEN LOAD ""CODE 39680: RANDOMI
ZE USR 50019: RANDOMIZE USR 5001
1
1109 REM ********************
1110 IF INKEY$="B" THEN INPUT "A
re you sure ? (Y/n) ";a$: IF a$=
"Y" THEN RANDOMIZE USR 50003: RA
NDOMIZE USR 50027
1120 RANDOMIZE USR 50003: REM
       (Retrieve screen.)
1125 RETURN
1399 REM ********************
1400 IF mod THEN RANDOMIZE USR 5
0011: RETURN
1405 RANDOMIZE USR 50003: RETURN

1499 REM ********************
1500 IF NOT mod THEN RANDOMIZE U
SR 50000: RETURN : REM
       (Window  Mode.)
1510 RANDOMIZE USR 50039: REM
       (Magnify Mode.)
1520 RETURN
1999 REM ********************
2000 CLEAR 32767: LOAD ""CODE
```



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BBC MUSIC



Complete that unfinished symphony with Nick Lea's masterly BBC composition.

THIS PROGRAM will only run on a BBC 1.2 operating system with Basic 2 mainly because the word "OSCLI" is used. To check whether the computer you use is suitable, type:

OSCLI("FXO") (RETURN)

If no error message is produced then this program should run.

The program is a tool for use in the writing, development or simple playback of music. It uses the BBC's three pitch channels to produce a possible three-line tune with simultaneous screen and sound note output. Also included in the program are routines to save and load tunes to or from tape, making it possible to store away a masterpiece you are particularly pleased with. For the musically uninitiated, or the plain lazy, there is a harmonisation routine which generates pseudo-random harmonies to a tune entered.

In its entirety — well, in this un-REM-ed version — the program is rather long and may seem an effort to type in all in one go. If certain procedures are left out, the program will run, until a non-existent option is selected, and if found to be useful, they can be added at a later date. The advantage of this is that it initially halves the program length.

The parts of the program which are optional to the main function are:

Line number	Procedure	Effect of losing it
2280	Procspeed	will not be able to change speed of playback
2A10	Procpitch	will not be able to change pitch of playback
25A0	Procsave	will not be able to save a tune to tape
2790	Procload	will not be able to load a tune from tape
3130	Procharmonise	will not be able to use the computer harmonise

Once the program — or section of the program — has been entered in the normal fashion, it can be run. This will produce a menu sheet with nine options open to the user. They are:

1. Play tune in memory.
2. Enter or edit a tune.
3. Change playback speed.
4. Change pitch of playback.
5. Save a tune onto tape.
6. Load a tune from tape.
7. Harmonise a tune in memory.
8. Clear memory.
9. Exit program.

When first run, there is no tune in the computer's memory. One can be entered using option 2, selected by just pressing 2. Option 2

(continued on next page)

(continued from previous page)

produces an instruction sheet which sets out the keyboard of a piano on to the BBC keyboard with the form as shown in table 1.

It shows how to change the lengths of notes using Shifted function keys. Three lines of music can eventually be built up so the line about to be used is asked for. A musical stave is then printed up and the tune can be entered. Return ends the tune and displays the menu sheet again. Selecting option 1 will now play the tune just put into the memory at its correct tempo. Tunes of up to 300 notes can be used and up to three can be played at once. The routines to change playback speed and pitch are self-explanatory and simply alter the global variables: Del% and Oct%.

The backing store routines — saving and loading — are done using the Beeb's BPut and BGet statements, thus a tune is treated as a machine-code file, but don't try to run it as one.

The last section of the program, and the last main option, produces harmonies on tracks two and three from a subject tune on track one. It requires the key signature of the tune, which is selected by pressing the appropriate note, and whether it is minor or major.

		S	D			G	H	J		2	3		5	6	7
	Z	X	C	V	B	N	M	Q	W	E	R	T	Y	U	I
		c#	d#		f#	g#	a#		c#	d#		f#	g#	a#	
= notes	C	D	E	F	G	A	B	C	D	E	F	G	A	B	C

Table 1.

Music on the Beeb. Note that the italicised "b" in line 2050 is CHR$ 22b.

```
   10 REM**********     MUSIC ON THE BEEB**
*
   20 REM*****              By Nick Lea
   30 REM****               ~~~~~~~~~~
   40 MODE 4
   50 REM   MAIN PROGRAM
   60 PROCinitialize
   70 ON ERROR GOTO 70
   80 PROCoptions
   90 IF OPT=1 THEN PROCplay(0)
  100 IF OPT=2 THEN PROCinput
  110 IF OPT=3 THEN PROCspeed
  120 IF OPT=4 THEN PROCpitch
  130 IF OPT=5 THEN PROCsave
  140 IF OPT=6 THEN PROCload
  150 IF OPT=7 THEN PROCharmonize
  160 IF OPT<>8 THEN 180
  170 IF FNyesno("Are you sure") THEN RU
N
  180 IF OPT<>9 THEN 80
  190 *FX11,30
  200 CLS
  210 END
  220 REM==================================
  230 DEFPROCplay(T%)
  240 PROCstave
  250 FOR I%=1 TO 3
  260 P%(I%)=TUNE+(I%-1)*300:B%(I%)=0
  270 NEXT I%
  280 REM*****MAIN LOOP****
  290 F%=0
  300 REPEAT
  310         K%=0:Z%=TIME AND DEL%
  320         FOR I%=1 TO 3
  330               IF B%(I%)=0 THEN PROCn
ext(I%,T%)
  340         NEXT I%
  350         IF K%=1 THEN PROCmovescreen
  360         FOR I%=1 TO 3
  370          B%(I%)=B%(I%)-1
  380         NEXT I%
  390         REPEAT
  400          D%=TIME AND DEL%
  410         UNTIL D%<>Z%
  420 UNTIL F%>=3
  430 ENDPROC
  440 REM==================================
  450 DEFPROCnext(I%,T%)
  460 IF I%=T% THEN PROCgetnote
  470 IF ?P%(I%)=0 THEN F%=F%+1:GOTO 520
  480 PROCsoundisplay((?P%(I%) AND 31),(
?P%(I%) AND 224)/32,I%)
  490 B%(I%)=L%(((?P%(I%)) AND 224)/32)
  500 P%(I%)=P%(I%)+1
  510 K%=1
  520 ENDPROC
  530 REM================================
  540 DEFPROCmovescreen
  550 SC%=SC%+SH%:SH%=1
  560 IF SC%>=192 THEN PROCstave
  570 ENDPROC
  580 REM================================
  590 REM  Pitch,Note length,Channel
  600 DEFPROCsoundisplay(P%,N%,C%)
  610 Q%=G%(P%)
  620 OSCLI("FX21,"+STR$(C%+4))
  630 SOUND C%,1,P%*4+OCT%,255
  640 Y%=ABS(Q%)*8+903-5*(SC% AND 224)
  650 X%=(SC% AND 31)*32+64
  660 MOVE X%,Y%
  670 VDU 233+N%
  680 IF N%>3 THEN PLOT 0,-24,-24:PLOT 2
,4,0:PLOT 0,20,24
  690 IF Q%<0 THEN VDU 240:SH%=2
  700 ENDPROC
  710 REM================================
  720 DEFPROCgetnote
  730 IF P%(I%)=TUNE+(300*I%)-1 THEN830
  740 REPEAT
  750         A%=GET
  760         ?key=A%
  770         CALLproc
  780           IF A%=127 THEN PROCdelete
  790           IF A%>127 AND A%<134 THEN L%
=A%-127
  800 UNTIL ?key OR A%=13 OR A%=32
  810 IF A%=13 THEN F%=3:?P%(I%)=0
  820 IF ?key<>0 THEN ?P%(I%)=32*L%+?key
  830 ENDPROC
  840 REM================================
  850 DEFPROCdelete
  860 IF P%(T%)=TUNE+(T%-1)*300 THEN 950
  870 P%(T%)=P%(T%)-1
  880 FOR W%=1 TO 3
  890 IF W%=T% THEN 920
  900 B%(W%)=B%(W%)+L%(((?P%(T%)) AND 22
4) DIV 32)
  910 IF B%(W%)=0 AND ?P%(W%)=0 THEN F%=
F%-1
  920 NEXT W%
  930 B%(T%)=0
  940 ?P%(T%)=0
  950 ENDPROC
  960 REM================================
  970 DEFPROCinitialize
  980 REM   UDC for stave
  990 VDU 23,225,0,0,0,0,0,0,255,0
 1000 VDU 23,226,0,0,255,0,0,0,255,0
 1010 REM     Treble clef
 1020 VDU 23,227,1,2,2,2,2,2,250,1
 1030 VDU 23,228,128,64,64,64,128,128,19
1,0
 1040 VDU 23,229,3,3,229,9,9,17,151,41
 1050 VDU 23,230,0,0,127,0,0,128,207,32
 1060 VDU 23,231,73,71,65,33,33,25,199,1
 1070 VDU 23,232,32,32,47,32,64,128,63,0
 1080 VDU 23,233,1,1,1,1,1,5,5,3
 1090 REM******NOTES******
 1110 VDU 23,235,8,8,8,8,8,56,120,48
 1120 VDU 23,236,8,8,8,8,8,59,123,48
 1130 VDU 23,237,8,8,8,8,8,56,120,48
 1140 VDU 23,238,8,8,8,8,8,59,123,48
 1150 VDU 23,239,0,0,0,0,0,48,120,48
 1160 VDU 23,240,0,44,56,40,108,56,104,4
0
 1170 DIM P%(3),B%(3),L%(6),G%(25),H%(12
,4)
 1180 DATA 1,2,3,4,6,8
 1190 FORI%=1 TO 6:READ L%(I%):NEXT I%
 1200 DATA 1,-1,2,-2,3,4,-4,5,-5,6,-6,7,
8,-8,9,-9,10,11,-11,12,-12,13,-13,14,15
 1210 FOR I%=1 TO 25:READ G%(I%):NEXT  I
%
 1220 DATA 8,5,10,6,5,10,5,10,12,8,6,10,
1,8,1,8,10,1,8,12,3,10,1,10,3,10,3,10
 1230 DATA 1,5,12,3,5,12,5,12,3,6,1,5,1,
5,1,5,5,8,3,8
 1240 FOR I1%=1 TO 12:FOR I2%=1 TO 4
 1250 READ H%(I1%,I2%)
 1260 NEXT I2%:NEXT I1%
 1270 DIM TUNE 900
 1280 ?TUNE=0:?(TUNE+300)=0:?(TUNE+600)=
0
 1290 OCT%=96:DEL%=16:L%=2:SH%=1
 1300 ENVELOPE 1,150,0,0,0,0,100,100,127
,-20,-20,-20,126,20
 1310 DIM key 1
 1320 DIM proc 50
 1330 DIM data 50
 1340 FOR I%=0 TO 2 STEP 2
 1350 P%=proc
 1360 [OPT I%
 1370                  LDX #25
 1380 .loop            LDA data-1,X
 1390                  CMP key
 1400                  BEQ fnd
 1410                  DEX
 1420                  BNE loop
 1430                  LDA #0
 1440                  STA key
 1450                  RTS
 1460 .fnd             TXA
 1470                  STA key
 1480                  RTS
 1490]
 1500 NEXT I%
 1510 $(data)="ZSXDCVGBHNJMQ2W3ERT5T6Y7UI
"
 1520 *FX11,0
 1530 *OPT 1,1
 1540 ENDPROC
 1550 REM==============================
 1560 DEFPROCstave
 1570 SC%=0
 1580 VDU 4:CLS
 1590 FOR V%=1 TO 6
 1600 VDU 10,227,228:PRINT STRING$(32,CH
R$(225))
 1610 VDU 229,230:PRINT STRING$(32,CHR$(
226))
 1620 VDU 231,232:PRINT STRING$(32,CHR$(
226))
 1630 VDU 233,13,10
 1640 NEXT V%
 1650 VDU 5
 1660 ENDPROC
 1670 REM================================
 1680 DEFPROCinput
 1690 CLS
 1700 PRINT
 1710 PRINT"Editing or Entering a tune"
 1720 PRINT"__________________________"
 1730 PRINT:PRINT"The computer's keyboar
d is set out"
 1740 PRINT"like a piano keyboard with t
he form-":PRINT
 1750 PRINT"  2 3   5 6 7       (HIGH OCT
AVE)"
 1760 PRINT" Q W E R T Y U I":PRINT
 1770 PRINT"  S D   G H J"
 1780 PRINT" Z X C V B N M      (LOW OCTA
VE)":PRINT
 1790 PRINT"      (Where Z & Q are 'C's)"
 1800 PRINT:PRINT"The note lengths may b
e changed by-"
 1810 PRINT"[shift] F0....Quaver"
 1820 PRINT"[shift] F1....Crotchet"
 1830 PRINT"[shift] F2....Dotted Crotche
t"
 1840 PRINT"[shift] F3....Minim"
 1850 PRINT"[shift] F4....Dotted Minim"
 1860 PRINT"[shift] F5....Semibreve"
 1870 PRINT:PRINT"[delete] will delete t
he last note"
 1880 PRINT"[return] returns to the opti
ons page"
 1890 PRINT"[space bar] skips over the n
ext note"
 1900 PRINT:PRINT"      ____________________
___________________"
 1910 PRINT:PRINT"A full tune is compose
d of up to 3 "
 1920 PRINT"lines.Please type in the lin
e to be "
 1930 PRINT"played or edited (1-3)>";
 1940 REPEAT
 1950         A%=GET:A%=A%-48
 1960 UNTIL A%>0 AND A%<4
 1970 PRINT STR$(A%)
 1980 PROCplay(A%)
 1990 ENDPROC
 2000 REM================================
 2010 DEFPROCoptions
 2020 VDU 4:CLS
 2030 PRINT:PRINT
 2040 PRINT"M U S I C    O N    T H E
      B B C"
 2050 PRINT"bbbbbbbbbbbbbbbbbbbbbbbbbbbbb
bbbbbbbbbbb"
 2060 PRINT:PRINT
 2070 PRINT"          Options Available-
"
 2080 PRINT"          ____________________
"
 2090 PRINT
 2100 PRINT"1......Play tune in memory"
 2110 PRINT"2......Enter or edit a tune"
 2120 PRINT"3......Change the playback s
peed"
 2130 PRINT"4......Change the pitch of p
layback"
 2140 PRINT"5......Save a tune on to tap
e"
 2150 PRINT"6......Load a tune from tape
"
 2160 PRINT"7......Harmonize a tune in m
emory"
 2170 PRINT"8......Clear memory"
 2180 PRINT"9......Exit from the program
"
 2190 PRINT:PRINT"  [escape]  returns to
 menu":PRINT
 2200 PRINT"    Press for option of your
 choice-"
 2210 PRINT:PRINT"            Option>";
 2220 REPEAT
 2230         A%=GET
 2240         OPT=A%-48
 2250 UNTIL OPT>0 AND OPT<10
 2260 PRINT STR$(OPT)
 2270 ENDPROC
 2280 REM================================
 2290 DEFPROCspeed
 2300 PRINT
 2310 PRINT"The current playback speed i
s ";LN(DEL%)/LN(2) -3
 2320 PRINT
 2330 PRINT"Please enter the new speed(1
-5)>";
 2340 REPEAT
 2350         A%=GET:A%=A%-48
 2360 UNTIL A%>0 AND A%<6
 2370 PRINT STR$(A%)
 2380 DEL%=2^(A%+3)
 2390 ENDPROC
 2400 REM================================
 2410 DEFPROCpitch
 2420 PRINT:PRINT "Pitch change UP or DO
WN >";
 2430 REPEAT
 2440         A%=GET
 2450 UNTIL A%=85 OR A%=68
```

(continued on page 112)

(continued from page 110)

```
2460 IF A%=85 THEN PRINT"Up" ELSE PRINT"Down"
2470 INPUT"By how many semitones [number,return]",Q%
2480 Q%=Q%*SGN(A%-75)*4
2490 IF Q%+OCT%>0 AND Q%+OCT%<150 THEN OCT%=OCT%+Q%:ENDPROC
2500 PRINT"That pitch change is too large"
2510 REM small delay
2520 Q%=INKEY(100)
2530 ENDPROC
2540 REM=============================
2550 DEFPROCsave
2560 CLS
2570 PRINT:PRINT"     Saving a tune on to tape"
2580 PRINT"          ______________________"
2590 IF NOT FNyesno("Are you sure") THEN ENDPROC
2600 PRINT:PRINT"Please make sure that-"
2610 PRINT"1.........A tape recorder is connected"
2620 PRINT"2.........The levels are correctly set"
2630 PRINT"3.........A usable tape is inside"
2640 PRINT:PRINT"Filename of tune (max length of 10)"
2650 INPUT">",F$
2660 IF LEN(F$)>10 THEN 2640
2670 file=OPENOUT F$
2680 FOR I=1 TO 3
2690 Q%=TUNE+(I-1)*300-1
2700 REPEAT
2710        Q%=Q%+1
2720        BPUT# file,?Q%
2730 UNTIL ?Q%=0
2740 NEXT I
2750 CLOSE# file
2760 PRINT"File saved.Please stop the tape."
2770 Q%=INKEY(200)
2780 ENDPROC
2790 REM=============================
2800 DEFPROCload
2810 CLS
2820 PRINT:PRINT
2830 PRINT"  Loading a tune from tape"
2840 PRINT"  ___________________________"
2850 PRINT:PRINT
2860 IF NOT FNyesno("Are you sure") THEN ENDPROC
2870 PRINT:PRINT"Please make sure that-"
2880 PRINT"1.........A tape recorder is connected"
2890 PRINT"2.........The levels are correctly set"
2900 PRINT
2910 INPUT"Filename",F$
2920 IF LEN(F$)>10 THEN PRINT"Can't be longer than 10 characters":GOTO 2910
2930 file=OPENIN F$
2940 FOR I=1 TO 3
2950 Q%=TUNE+300*(I-1)-1
2960 REPEAT
2970        Q%=Q%+1
2980        ?Q%=BGET# file
2990 UNTIL ?Q%=0
3000 NEXT I
3010 CLOSE# file
3020 PRINT"File loaded"
3030 Q%=INKEY(200)
3040 ENDPROC
3050 REM=============================
3060 DEFFNyesno(A$)
3070 PRINT:PRINT A$+"(Yes/No)?";
3080 REPEAT
3090        A%=GET
3100 UNTIL A%=89 OR 78
3110 IF A%=89 THEN PRINT"Yes" ELSE PRINT"No"
3120 =(A%=89)
3130 REM=============================
3140 DEFPROCharmonize
3150 CLS
3160 PRINT:PRINT
3170 PRINT"     H A R M O N I Z I N G"
3180 PRINT"     ~~~~~~~~~~~~~~~~~~~~~~"
3190 PRINT:PRINT
3200 PRINT"  This harmonization routine requires"
3210 PRINT"  that the tune to be harmonized is"
3220 PRINT"  is put onto LINE 1."
3230 PRINT"  The computer will then generate "
3240 PRINT"  harmonies on LINES 2 & 3."
3250 PRINT:PRINT
3260 IF ?TUNE<>0 THEN 3350
3270 PRINT"     There is no tune on LINE 1."
3280 PRINT:PRINT"          Please put one on"
3290 PRINT"          ~~~~~~~~~~~~~~~~~"
3300 PRINT"  (Press [Space bar] to return to menu)"
3310 REPEAT
3320        A%=GET
3330 UNTIL A%=32
3340 ENDPROC
3350 PRINT"   Is the tune currently on LINE 1"
3360 IF NOT FNyesno("    to be harmonized") THEN 3280
```

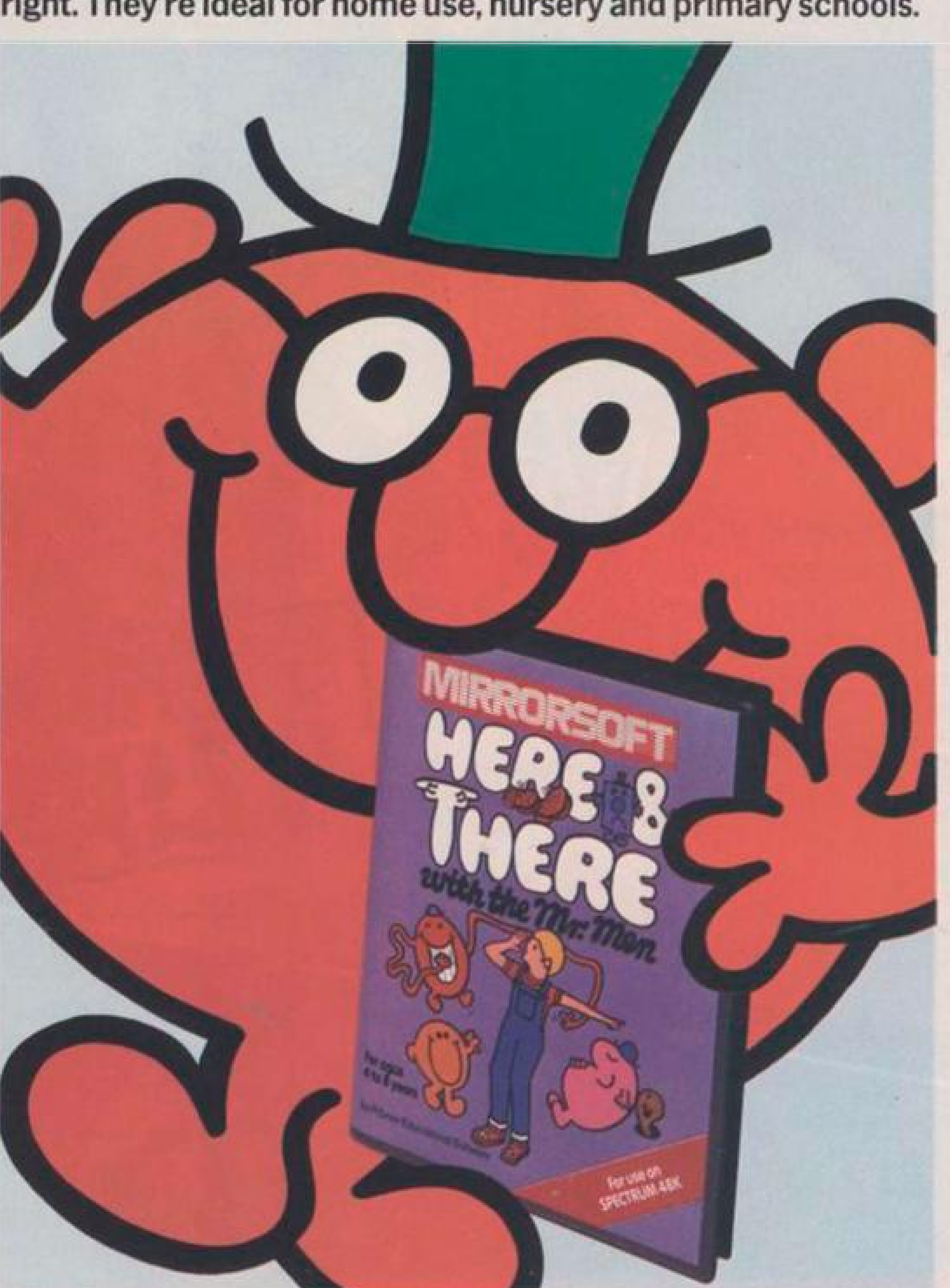


```
3370 PRINT:PRINT"If the keyboard is arranged-"
3380 PRINT"  S D   G H J"
3390 PRINT" Z X C V B N M"
3400 PRINT:PRINT"then press the note corresponding to"
3410 PRINT"          the key  >"
3420 REPEAT
3430        A%=GET
3440        ?key=A%
3450        CALL proc
3460 UNTIL ?key<>0
3470 S%=(?key-1) MOD 12
3480 PRINT:PRINT"The key of harmonization is ";S%+1;" keys "
3490 PRINT"    up the keyboard"
3500 PRINT:INPUT"Major or Minor(MAJ/MIN)";A$
3510 IF A$<>"MAJ" AND A$<>"MIN" THEN 3500
3520 IF A$="MIN" THEN S%=(S%+3) MOD 12
3530 REM******HARMONIZATION****
3540 POINT%=TUNE
3550 BASS%=1
3560 REPEAT
3570        PITCH%=?POINT% AND 31
3580        N%=(?POINT% AND 224) DIV 32
3590        SC%=(PITCH%+12-S%) MOD 12
3600        IF SC%=0 THEN SC%=12
3610          DIFF%=12
3620          FOR I%=1 TO 4
3630          H%=ABS(H%(SC%,I%)-1-BASS%)
3640          IF H%<DIFF% THEN V%=I%:DIFF%=H%
3650          NEXT I%
3660          BASS%=H%(SC%,V%)
3670          H1%=BASS%+S%:IF H1%>12 THEN H1%=H1%-12
3680          V%=V%+(RND(2)*2)-3:IF V%=0 THEN V%=2
3690          IF V%=5 THEN V%=3
3700          H2%=H%(SC%,V%)+S%
3710          IF H2%<H1% THEN H2%=H2%+12
3720          IF RND(4)=1 THEN R%=1 ELSE R%=0
3730          ?(POINT%+300)=32*N%+H1%
3740          ?(POINT%+600)=32*N%+R%*H2%+(1-R%)*H1%
3750        POINT%=POINT%+1
3760 UNTIL ?POINT%=0
3770 ?(POINT%+299)=32*N%+S%+1:?(POINT%+599)=32*N%+S%+8
3780 ?(POINT%+300)=0:?(POINT%+600)=0
3790 CLS
3800 PRINT"HARMONIZATION COMPLETE"
3810 PRINT"~~~~~~~~~~~~~~~~~~~~~~"
3820 A%=INKEY(100)
3830 ENDPROC
```

Introduce your kids to another friendly teacher.

The Mr. Men and friends, have all gone back to school. They're learning a lot. So they can help youngsters, from 4 upwards, to an enjoyable start on the rudiments of reading, and the basics of arithmetic.

There are games for keen-eyed youngsters to sharpen observation, and games to help unravel the mysteries of left and right. They're ideal for home use, nursery and primary schools.











HERE & THERE WITH THE MR. MEN

Telling left from right, and working out simple routes can confuse young children. In these four games they learn by giving directions to the Mr. Men. Watching what happens on screen is fun. The games progress in difficulty as the children get more expert.

For 5 to 8 year olds. On cassette for the Spectrum 48K, BBC B and Electron. £7.95

WORD GAMES WITH THE MR. MEN

Some sorts of words can cause difficulty for children just starting to read. This double cassette pack takes an amusing look at comparatives and superlatives. It also has fun with opposites and keeps Mr. Bounce leaping about with positional adverbs. Fourteen games in all. Includes keyboard overlay and illustrated book.

For 5 years upwards. On cassette for the Spectrum 48K. £9.95

Also available: First Steps with the Mr. Men – games for pre-readers. On cassette for the BBC B, Electron, CBM64 and Spectrum 48K. £8.95

COUNT WITH OLIVER

Two games in which cheeky young Oliver learns to count and do simple sums. Choosing different toys in various colours requires single digit answers from the players.

Next greedy Oliver asks for lollipops and adds up different shapes and colours. Subtraction is achieved when Oliver devours the lollipops. He swells visibly and his fate will delight young children.

For 4 to 7 year olds. On cassette for the CBM64, Spectrum 48K, BBC B and Electron. £7.95

LOOK SHARP!

Two programs with seven games to test and train children's powers of observation in an amusing way. On Old MacDonald's farm they sort the sheep from the geese and the cows from the pigs. The games are Memory, Odd-one-out and Snap.

SORT, the second program, is a space observer's test with a variety of space scenes to scan and remember.

For 3 to 11 year olds. On cassette for the CBM64, Spectrum 48K, BBC B and Electron. £7.95

QUICK THINKING!

Two futuristic, arithmetical mind stretchers. In SumVaders aliens in numbered space ships drop numbered robots. Correctly added or subtracting the two numbers destroys the robot. If you are wrong or late the robot lands. Correct answers are displayed. Five levels of difficulty.

Robot Tables puts the player in charge of a robot making machine. Maximum robot output is only achieved by mastering multiplication tables to give the correct instructions to the machine.

For 7 years to adult. On cassette for the CBM64, Spectrum 48K, BBC B and Electron. £6.95

All CBM64 and BBC B versions are available on disk.

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CURSE OF ABU SIMBEL

Nick Stevens unwraps a new game for the Dragon 32

The Curse of Abu Simbel is an adventure game written for the Dragon 32. The object of the game is to find the Golden Mask of Abu Simbel — but beware of the Curse!

The game uses the standard Verb-Noun input format but with a few extras — pushing Shift and an arrow key will abbreviate the direction commands. For example, pressing Shift and up arrow will print Go North, press Enter to input.

Also, when getting an object, you can use It to refer to the object. Other features of the game are split screen scrolling, a real-time clock, a diagram of current exits and sound.

The Dragon's sound command has been redefined for extra flexibility. The new format is Sound N,N — where N is any number between 1 and 65535. The second number now refers to number of cycles and the first is the pitch. The real-time clock is displayed at the top of the screen along with a compass and the room's exits.

First type in listing 1 and Save at the start of a blank tape. This program sets up the sound, clock and scroll routines, it also loads and runs the main program. Second type in listing 2. Do not attempt to run this program without first running listing 1, as it calls the machine-code routines set up in listing 1.

To aid debugging it would be useful to miss out lines 5 and 6 until the program is fully working. These lines disable the Break key, List and LList functions.

Now Save this program after the first by:

GOTO 9000

This will Save and autorun the program.

I will supply a copy of the program for £2.50. Please send a blank cassette and an S.A.E. to: Nick Stevens, 8 Hope Place, Musselburgh, East Lothian EH21 7QE.

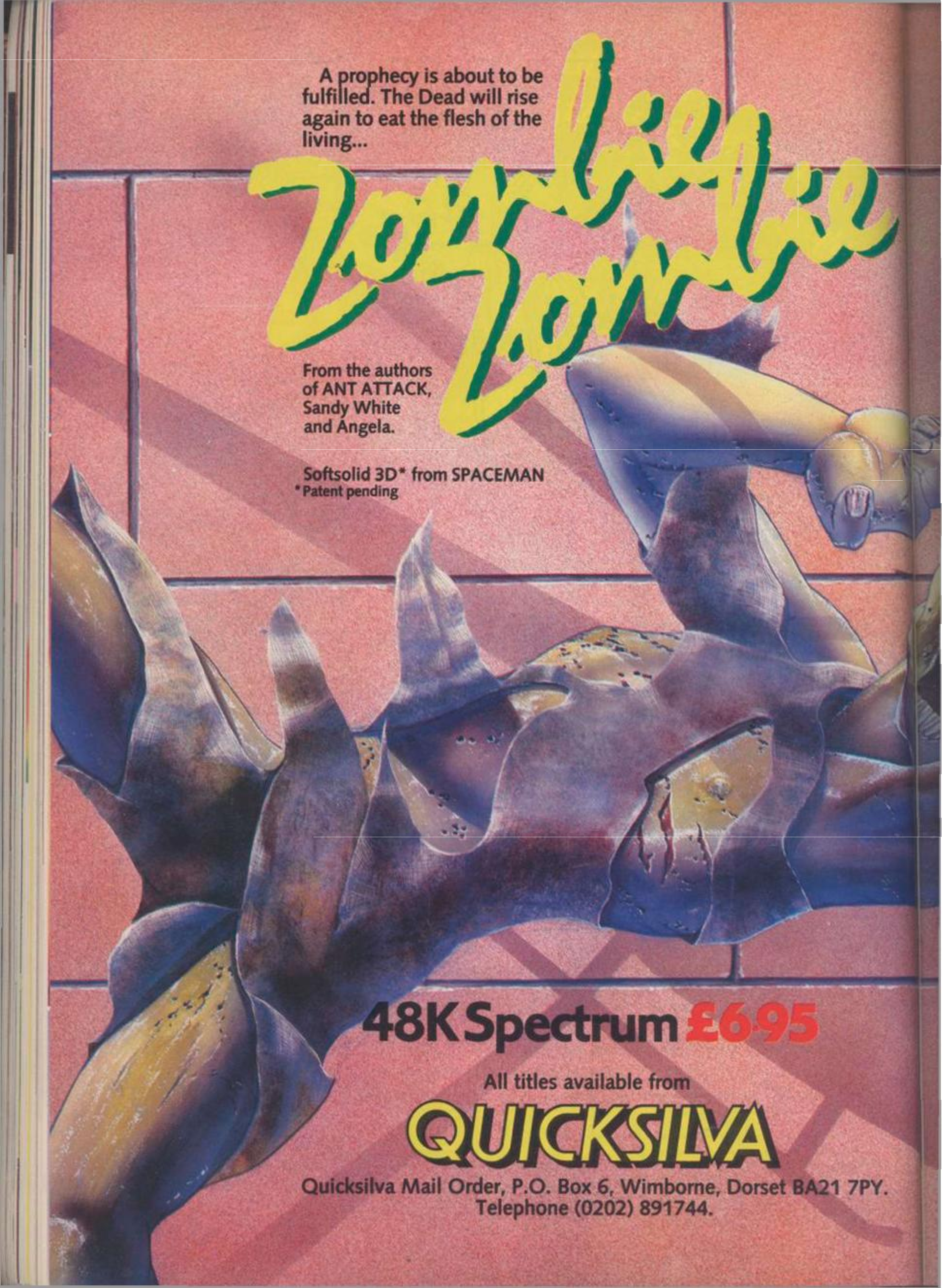
Listing 1.

```
10 CLEAR500,31999:CLS:PRINT@38,"PLEASE WAIT A MOMENT."
20 PCLEAR1
30 X=32000
40 READA$:IF A$="END" THEN 60
50 POKEX,VAL("&H"+A$):X=X+1:GOTO40
60 EXEC32000
70 EXEC32141
80 PRINT@134,"LOADING MAIN PROGRAM."
90 CLOADM
100 DATA10,8E,7E,67,8E,80,33,10,BF,01,21,A6,80,A7,A0,8C,81,CA,25,F7,8E,7F,88,BF,
01,23
110 DATA8E,7D,21,BF,7F,CC,39,34,36,BD,8E,83,27,15,BF,01,44,35,36,BD,89,AA,34,36,
BD,8E,83
120 DATABF,01,46,BD,00,A5,27,07,35,36,C6,02,7E,83,44,B6,FF,03,84,FE,B7,FF,03,B6,
FF,23,8A,08
130 DATAB7,FF,23,B6,FF,01,84,F7,B7,FF,01,10,BE,01,46,86,FD,B7,FF,20,BE,01,44,30,
1F,26,FC,7F,FF,20
140 DATABE,01,44,30,1F,26,FC,31,3F,26,E6,B6,FF,23,84,F7,B7,FF,23,B6,FF,03,8A,01,
B7,FF,03,35,36,39
150 DATA30,CC,51,6F,84,6F,82,86,3B,A1,82,24,02,6F,84,86
160 DATA17,A1,82,24,02,6F,84,30,CC,0B,BF,01,0D,39,8E,9D
170 DATA3D,BF,01,0D,39,30,CC,2C,6C,84,86,32,A1,84,26,1E
180 DATA6F,84,6C,82,86,3C,A1,84,26,14,6F,84,6C,82,A1,84
190 DATA26,0C,6F,84,6C,82,86,18,A1,84,26,02,6F,84,7E,9D,3D,00,00,00,00
200 DATA8E,04,A0,A6,88,20,A7,80,8C,05,DF,26,F6,39
210 DATA END
```

Listing 2.

```
5 POKE&H19B,6:POKE&H19C,&H7E:POKE&H19D,&HB4:POKE&H19E,&HA6:POKE&H19A,&H35
6 POKE383,158:POKE157,125:POKE158,0
10 R=12:I=0:MU=1:CR=1:P=0:PP=0:T=0:M=0:MM=0:L=0:O=0
20 DIMR$(68),V$(31),N$(22),D(68,3),NP(25)
30 CLS1
40 FORA=0 TO 24 STEP2:PRINT@A,CHR$(172);CHR$(236);:NEXTA:PRINTSTRING$(6,128);
50 PRINT@32,STRING$(128,128);
60 PRINT@34,"n";:PRINT@65,"w e";:PRINT@98,"s";:POKE1090,42
70 PRINT@43,"time";:POKE1071,61
80 PRINT@73,CHR$(177);STRING$(8,179);CHR$(178);
90 PRINT@105,CHR$(181);"00:00:00";CHR$(186);
100 PRINT@137,CHR$(180);STRING$(8,188);CHR$(184);
110 PRINT@84,"exits";:POKE1113,58
120 PRINT@60,CHR$(206);CHR$(204);CHR$(205);
130 PRINT@92,CHR$(202);CHR$(128);CHR$(197);
140 POKE1504,149
150 PRINT@124,CHR$(203);CHR$(195);CHR$(199);
160 SOUND2000,10
170 PRINT@456,"DOUBLE SPEED :?";
180 A$=INKEY$:IF A$="" THEN180
190 IF A$="Y" THEN PRINTCHR$(8);"Y";:POKE65495,0 ELSE IF A$="N" THEN PRINTCHR$(8
);"N";:POKE65494,0 ELSE GOTO 170
200 SOUND20,60
210 A$=INKEY$:IF A$=CHR$(8) THEN SOUND30,80:GOTO170 ELSE IF A$=CHR$(13) THEN SOU
ND80,30:GOTO 220 ELSE 210
220 FORA=1 TO 4:EXEC32226:NEXTA
```

(continued on page 119)



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(continued from page 115)

```
230 SOUND400,20
240 PRINT@457,"PLEASE WAIT!"
250 EXEC32226
260 READA$:FORA=1 TO 4:R$(A)=A$:NEXTA
270 READR$(5)
280 FORA=6 TO 9:R$(A)=A$:NEXTA
290 FORA=10 TO 68:READR$(A):NEXTA
300 SOUND400,20:EXEC32226
310 FORA=1 TO 68
320 FORB=0 TO 3
330 READD(A,B)
340 NEXTB,A
350 SOUND400,20:EXEC32226
360 FORA=1 TO 31:READV$(A):NEXTA
370 SOUND400,20:EXEC32226
380 FORA=1 TO 22:READN$(A),NP(A):NEXTA
390 SOUND400,20:EXEC32226
400 FORA=1 TO 5:EXEC32226:SOUND20,50:NEXTA
410 POKE32222,0:POKE32223,0:POKE32224,0
420 GOSUB3570
430 A$=R$(R):GOSUB3580
435 IF R=44 THEN GOTO 435
440 FORA=1 TO 22:IF NP(A)=R THEN PRINT@449,"HERE'S ";N$(A);".":EXEC32226:SOUND9
00,5
450 NEXTA
460 GOSUB3720
470 IF R=29 AND MU=1 THEN PRINT@449,"A MAD MUMMY BLOCKS YOUR PATH!":EXEC32226:FO
RA=1TO 5:SOUND90,10:SOUND40,20:NEXTA
480 IF R=53 AND CR=1 THEN CC=-1:PRINT@449,"THE CROCODILES START MOVING!":EXEC322
26:FORA=1 TO 5:SOUND10,50:SOUND50,10:NEXTA ELSE CC=0:CO=0
490 IF CC=-1 THEN CO=CO+1:IF CO)3 THEN PRINT@449,"THE REPTILES JUST MADE A MEAL"
:EXEC32226:PRINT@449,"OF YOU!!!":EXEC32226:GOTO3780
500 IF P=1 THEN PP=PP+1:IF PP)10 THEN PRINT@449,"YOUR SKIN HAS BECOME RED AND":E
XEC32226:PRINT@449,"BLOCHY! YOU MUST HAVE CAUGHT":EXEC32226:PRINT@449,"SOMETHING
 IN THE TOMB!":EXEC32226:GOTO3780
510 IF PP)7 THEN PRINT@449,"YOU FEEL SICK!":EXEC32226:SOUND2000,10
520 IF NP(19)=-2 THEN P=0
530 IF R=63 OR R=65 OR R=67 THEN IF RND(5)=3 THEN PRINT@449,"THE FLOOR JUST COLA
PSED!":EXEC32226:R=31:FORA=1 TO 300 STEP 10:SOUNDA,10:NEXTA
540 IF R=41 AND N$="WEST" THEN PRINT@449,"THE DOOR SLAMS SHUT BEHIND YOU":EXEC32
226:SOUND300,20:SOUND400,10
550 IF M=1 THEN MM=MM+1
560 IF MM)10 THEN N$(21)="A DEAD MONKEY":M=0
570 IF NP(21)()-2 AND RND(5)=2 AND MM)10 THEN NP(21)=-1
580 IF L=1 AND R=21 AND NP(5)=-2 THEN PRINT@449,"YOUR LIGHT REVEALS A":SOUND10,1
0:EXEC32226:PRINT@449,"PASSAGE LEADING SOUTH":SOUND10,10:EXEC32226:D(21,1)=26:GO
SUB3720
590 IF R=16 AND N$="WEST" THEN IF RND(5)=2 THEN PRINT@449,"YOU SEEM TO HAVE DROW
NED!":EXEC32226:FORA=1 TO 20:SOUNDA,A:NEXTA:GOTO3780600 IF R=16 AND N$="WEST" TH
EN PRINT@449,"LUCKY YOU DIDN'T DROWN!":SOUND40,20:SOUND20,40:EXEC32226
610 GOSUB3570
620 C$=")":C=0:W$=""
630 PRINT@449,"==)";
640 SOUND500,10:SOUND400,10:SOUND300,10
650 X=-1
660 PRINTC$;:POKE135,0
670 PRINTCHR$(8);C$;:FORA=1 TO 70:A$=INKEY$:IF A$="" THEN NEXTA:PRINTCHR$(8);" "
;:FORA=1 TO 70:A$=INKEY$:IF A$="" THEN NEXTA:GOTO670680 A=ASC(A$)
690 PRINTCHR$(8);
700 IF A=95 THEN W$="GO NORTH":C=8:PRINT@452,W$;STRING$(18,32);:PRINT@460,"";:SO
UND50,10:GOTO660
710 IF A=91 THEN W$="GO SOUTH":C=8:PRINT@452,W$;STRING$(18,32);:PRINT@460,"";:SO
UND50,10:GOTO660
720 IF A=21 THEN W$="GO WEST":C=7:PRINT@452,W$;STRING$(19,32);:PRINT@459,"";:SOU
ND50,10:GOTO660
730 IF A=93 THEN W$="GO EAST":C=7:PRINT@452,W$;STRING$(19,32);:PRINT@459,"";:SOU
ND50,10:GOTO660
740 IF A=8 AND C(1 THEN 660
750 IF A=8 THEN PRINTCHR$(8);:W$=LEFT$(W$,LEN(W$)-1):C=C-1:GOTO660
760 IF A=13 THEN 830
770 IF A(32 THEN 660
780 C=C+1:IF C)26 THEN C=26:GOTO660
790 W$=W$+CHR$(A)
800 PRINTCHR$(A);
810 SOUND10,10
820 GOTO660
830 FORA=10 TO 20:SOUNDA,20:NEXTA:GOSUB3560
840 EXEC32226
850 IF W$="" OR LEN(W$)(3 THEN 620
860 B=0:V$="":N$=""
870 IF LEN(W$)(3 THEN 620 ELSE A=ASC(MID$(W$,1,1)):IF A(65 OR A)90 THEN W$=RIGHT
$(W$,LEN(W$)-1):GOTO870
880 A=INSTR(1,W$," ")
890 IF A=0 THEN V$=W$:N$="":GOTO920
900 V$=LEFT$(W$,A-1)
910 N$=RIGHT$(W$,LEN(W$)-A)
920 FORB=1 TO 31
930 IF LEFT$(V$,3)=LEFT$(V$(B),3) THEN 960
940 NEXTB
950 PRINT@449,"I DON'T UNDERSTAND!":EXEC32226:FORA=100 TO 50 STEP-1:SOUNDA,1:NEX
TA:GOTO620
960 ON B GOTO 970,1030,1030,1170,1230,1290,1290,1380,1380,1400,1510,1550,1600,16
60,1710,1710,1830,1910,420,1950,2070,2500,2540,2540,2540,2590,2640,2690,1170,274
0,2780
970 IF N$="NORTH" AND D(R,0)()0 THEN R=D(R,0):GOTO 420
980 IF N$="SOUTH" AND D(R,1)()0 THEN R=D(R,1):GOTO420
990 IF N$="WEST" AND D(R,2)()0 THEN R=D(R,2):GOTO420
1000 IF N$="EAST" AND D(R,3)()0 THEN R=D(R,3):GOTO420
1010 PRINT@449,"YOU CAN'T GO THAT WAY!":SOUND15,300
1020 EXEC32226:GOTO620
1030 IF N$="IT" THEN 1130
1040 IF N$="" THEN PRINT@449,"GET WHAT?":EXEC32226:SOUND40,60:GOTO470
1050 FORA=1 TO 22
1060 O=INSTR(1,N$(A),N$)
1070 IF O=0 THEN NEXTA:PRINT@449,"YOU CAN'T!":EXEC32226:SOUND20,20:SOUND30,20:SO
UND10,20:GOTO470
1080 IF NP(A)()R THEN PRINT@449,"IT'S NOT HERE!":SOUND50,10:SOUND70,10:SOUND20,1
0:SOUND70,10:EXEC32226:GOTO470
1090 I=I+1:IF I)5 THEN I=5:PRINT@449,"IT'S TOO HEAVY!":SOUND500,10:SOUND25,20:SO
UND700,10:EXEC32226:GOTO470
1100 NP(A)=-2
1110 IF A=21 THEN M=1
1120 PRINT@449,"GOT IT!":EXEC32226:FORA=300 TO 1 STEP-20:SOUNDA,5:NEXTA:GOTO470
1130 FORA=1 TO 22
1140 IF NP(A)=R THEN 1090
1150 NEXTA
1160 PRINT@449,"GET WHAT?":SOUND100,50:EXEC32226:GOTO470
1170 IF N$="" OR N$="IT" THEN PRINT@449,"DROP WHAT?":EXEC32226:SOUND40,60:GOTO47
0
1180 FORA=1 TO 22
1190 O=INSTR(1,N$(A),N$)
1200 IF O=0 THEN NEXTA:PRINT@449,"YOU CAN'T!":EXEC32226:SOUND20,20:SOUND20,30:SO
UND10,20:GOTO470
1210 IF NP(A)()-2 THEN PRINT@449,"YOU HAVEN'T GOT THAT!":EXEC32226:SOUND70,10:SO
UND50,10:SOUND20,10:SOUND70,10:GOTO470
1220 I=I-1:NP(A)=R:PRINT@449,"DROPPED IT!":EXEC32226:FORA=30 TO 60:SOUNDA,15:NEX
TA:GOTO470
1230 IF N$="" THEN PRINT@449,"WHICH WAY?":SOUND90,70:EXEC32226:GOTO470
1240 IF R=10 OR R=16 OR R=21 THEN IF RND(5)()2 THEN PRINT@449,"THE SEA WASHED YO
U UP AGAIN!":EXEC32226:SOUND150,10:GOTO470
1250 IF R=10 OR R=16 OR R=21 THEN PRINT@449,"YOU SEEMED TO HAVE DROWNED!":EXEC32
226:FORA=30 TO 50:SOUNDA,1:NEXTA:GOTO3770
1260 IF R=35 THEN 970
1270 IF R=58 THEN PRINT@449,"YUCK! IT'S ALL STICKY!":EXEC32226:SOUND60,40:PRINT@
449,"SOMETHING TOUCHED YOUR FOOT!":SOUND40,10:EXEC32226:NP(16)=58:P=1:GOTO470
1280 PRINT@449,"WHERE??":EXEC32226:SOUND10,70:GOTO470
1290 IF N$="" THEN PRINT@449,"PULL WHAT?":EXEC32226:SOUND600,5:GOTO470
1300 IF R=40 THEN GOTO 1330
1310 IF R=51 THEN GOTO 1350
1320 PRINT@449,"YOU CAN'T!":EXEC32226:SOUND50,50:GOTO470
1330 IF LEFT$(N$,3)="PAN" THEN PRINT@449,"A PANNEL CREAKS OPEN!":SOUND40,80:SOUN
D50,80:SOUND40,80:EXEC32226:D(40,2)=39:GOSUB3720:GOTO470
1340 GOTO1320
1350 IF LEFT$(N$,3)="LEF" OR LEFT$(N$,3)="RIG" THEN GOTO 1360 ELSE PRINT@449,"WH
ICH ONE?":SOUND10,90:EXEC32226:GOTO470
1360 IF LEFT$(N$,3)="LEF" THEN PRINT@449,"A PIT IN THE FLOOR OPENS!":EXEC32226:S
OUND90,90:PRINT@449,"YOU FALL THROUGH INTO....":FORA=90 TO 150:SOUNDA,5:NEXTA:EX
EC32226:PRINT@449,"A PIT OF SNAKES!":SOUND90,90:EXEC32226:GOTO3780
1370 PRINT@449,"THE GATE SLIDES SLOWLY UP!":FORA=500 TO 400 STEP-10:SOUNDA,10:NE
XTA:EXEC32226:D(51,1)=60:GOSUB3720:GOTO470
1380 IF N$="" THEN PRINT@449,"BREAK WHAT?":EXEC32226:SOUND40,80:GOTO470
1390 PRINT@449,"YOU CAN'T!":SOUND40,60:SOUND300,5:EXEC32226:GOTO470
1400 IF N$="" THEN PRINT@449,"EH?!":SOUND40,50:EXEC32226:GOTO470
1410 IF LEFT$(N$,3)()"DRU" THEN PRINT@449,"YOU CAN'T!":SOUND40,90:EXEC32226:GOTO
470
1420 IF NP(2)()-2 THEN PRINT@449,"YOU HAVEN'T GOT IT!":SOUND50,80:EXEC32226:GOTO
470
1430 IF NP(11)()-2 THEN PRINT@449,"WITH WHAT?":EXEC32226:SOUND50,75:GOTO470
1440 FORA=1 TO 5:SOUND500,15:FORX=1 TO 100:NEXTX
1450 NEXTA
1460 IF R()14 THENPRINT@449,"NEAT BEAT!":EXEC32226:GOTO470
1470 PRINT@449,"THE BOULDER TREMBLES.....":SOUND3000,10
1480 EXEC32226:PRINT@449,"AND ROLLS AWAY REVEACING A":EXEC32226:PRINT@449,"SMALL
 CAVE.":EXEC32226
1490 D(14,3)=15:GOSUB3720
1500 GOTO470
1510 IF N$="" THEN PRINT@449,"SHAKE WHAT?":EXEC32226:SOUND50,80:GOTO470
1520 IF LEFT$(N$,3)="TRE" AND R=13 AND T=0 THEN PRINT@449,"BONK!":EXEC32226:FORA
=1 TO 30:SOUNDA,1:NEXTA:SOUND50,50:NP(3)=R:NP(4)=R:T=1:GOTO470
1530 IF LEFT$(N$,3)="SKE" AND R=41 THEN PRINT@449,"RATTLE! RATTLE!":EXEC32226:SO
UND10,5:SOUND20,5:SOUND5,10:NP(15)=R:GOA
1550 IF N$="" THEN PRINT@449,"LOAD WHAT?":EXEC32226:SOUND70,70:SOUND20,90:GOTO47
0
1560 IF LEFT$(N$,3)="GUN" AND NP(12)=-2 AND NP(13)=-2 THEN PRINT@449,"THE GUN IS
 READY TO FIRE.":SOUND50,10:SOUND40,20:SOUND30,30:EXEC32226:G=1:NP(13)=-1:I=I-1:
GOTO470
1570 IF LEFT$(N$,3)="GUN" AND NP(12)()-2 THEN PRINT@449,"YOU HAVEN'T GOT A GUN!"
:EXEC32226:SOUND50,10:GOTO470
1580 IF LEFT$(N$,3)="GUN" AND NP(13)()-2 THEN PRINT@449,"WHAT WITH?":SOUND50,10:
EXEC32226:GOTO470
1590 PRINT@449,"YOU CAN'T LOAD THAT!":SOUND30,10:EXEC32226:GOTO470
1600 IF N$="" THEN PRINT@449,"SHOOT WHAT?":EXEC32226:SOUND40,10:SOUND30,40:GOTO4
70
1610 IF LEFT$(N$,3)="MUM" AND G=1 AND NP(12)=-2 ANS R=29 THEN FORA=1 TO 4:PRINT@
449,"BANG!":SOUND200,50:EXEC32226:NEXTA:PRINT@449,"THE MUMMY FALLS DEAD!":EXEC32
226:SOUND40,80:PRINT@449,"A DARK PASSAGE IS REVEALED!":EXEC32226:A=-1
1620 IF A=-1 THEN SOUND40,40:D(29,1)=48:MU=-1:GOSUB3720:GOTO470
1630 IF NP(12)()-2 THEN PRINT@449,"WHAT WITH?":EXEC32226:SOUND90,10:SOUND10,90:G
OTO470
1640 IF G()1 THEN PRINT@449,"THE GUN ISN'T LOADED!":SOUND40,40:EXEC32226:GOTO470
1650 PRINT@449,"BANG!":SOUND200,50:EXEC32226:PRINT@449,"YOU SHOT INTO THE AIR!":
EXEC32226:G=0:SOUND10,10:GOTO470
1660 IF N$="" THEN PRINT@449,"LIGHT WHAT?":EXEC32226:SOUND90,90:GOTO470
1670 IF LEFT$(N$,3)()"LAN" THEN PRINT@449,"YOU CAN'T LIGHT THAT!":SOUND30,30:SOU
ND40,40:EXEC32226:GOTO470
1680 IF NP(5)()-2 THEN PRINT@449,"YOU HAVEN'T GOT THAT!":SOUND10,90:EXEC32226:GO
TO470
1690 IF NP(4)()-2 THEN PRINT@449,"WHAT WITH?":EXEC32226:SOUND210,20:GOTO470
1700 PRINT@449,"THE LANTERN SHINES BRIGHTLY.":EXEC32226:FORA=40 TO 200 STEP 10:S
OUNDA,5:NEXTA:L=1:GOTO470
1710 IF N$="" THEN PRINT@449,"OPEN WHAT?":EXEC32226:SOUND200,10:SOUND10,200:GOTO
470
1720 IF LEFT$(N$,3)="DOO" AND R=30THEN PRINT@449,"THE DOOR SQUEEKS NOISILY OPEN!
":EXEC32226:SOUND20,20:SOUND30,30:SOUND40,40:D(30,1)=32:GOSUB3720:GOTO470
1730 IF LEFT$(N$,3)="CHE" AND R=36 AND NP(7)=-2 THEN PRINT@449,"THE CHEST OPENS
RELUCTANTLY.":EXEC32226:SOUND40,90:NP(13)=R:GOTO470
1740 IF LEFT$(N$,3)="DOO" AND R=45 AND NP(15)=-2 AND NP(16)=-2 AND NP(17)=-2 THE
N PRINT@449,"THE GREAT DOOR OPENS SLOWLY!":EXEC32226:SOUND3000,5:D(45,2)=44:GOSU
B3720:GOTO470
1750 IF (R=41 OR R=50) AND LEFT$(N$,3)="DOO" THEN PRINT@449,"IT WON'T BUDGE!":EX
EC32226:SOUND90,80:GOTO470
1760 IF (LEFT$(N$,3)="GAT" OR LEFT$(N$,3)="POR") AND R=51 THEN PRINT@449,"IT'S T
OO HEAVY TO OPEN!":EXEC32226:SOUND40,80:SOUND80,40:GOTO470
1770 IF R=38 AND LEFT$(N$,3)="SAR" THEN PRINT@449,"WHICH ONE?":EXEC32226:SOUND40
,10:GOTO470
1780 IF R=38 AND LEFT$(N$,3)="THR" THEN PRINT@449,"IT CREAKS OPEN!":EXEC32226:FO
RA=70 TO 90:SOUNDA,5:NEXTA:PRINT@449,"REVEALING A SMALL PASSAGE!":EXEC32226:SOUN
D30,90:D(38,0)=42:GOSUB3720:GOTO470
1790 IF R=38 AND (LEFT$(N$,3)="ONE" OR LEFT$(N$,3)="TWO" OR LEFT$(N$,3)="FOU" OR
 LEFT$(N$,3)="FIV") THEN PRINT@449,"THERE'S NOTHING INSIDE!":EXEC32226:SOUND50,5
0:SOUND60,50:SOUND90,50:GOTO470
1800 IF R=45 THEN PRINT@449,"IT'S LOCKED!":SOUND30,100:EXEC32226:GOTO470
1810 IF LEFT$(N$,3)="DOO" THEN PRINT@449,"WHAT DOOR?":EXEC32226:SOUND500,10:GOTO
470
1820 PRINT@449,"YOU CAN'T DO THAT!":SOUND150,50:EXEC32226:GOTO470
1830 IF N$="" THEN PRINT@449,"READ WHAT?":EXEC32226:SOUND100,10:SOUND150,10:GOTO
470
1840 IF R=12 AND LEFT$(N$,3)="SIG" THEN PRINT@449,"IT SAYS : BEWARE THE CURSE OF
":EXEC32226:SOUND40,40:PRINT@459,"ABU SIMBEL!":EXEC32226/SOUND40,40:SOUND40,80:G
OTO470
1850 IF LEFT$(N$,3)="SCR" AND NP(8)=-2 THEN PRINT@449,"IT SAYS : ABU WAS HERE OK
!":EXEC32226:SOUND60,60:GOTO470
1860 IF R=39 OR R=14 THEN 1880
1870 PRINT@449,"YOU CAN'T!":SOUND20,20:EXEC32226:GOTO470
1880 IF R=14 AND (LEFT$(N$,3)="BOU" OR LEFT$(N$,3)="HIE") THEN PRINT@449,"YOU CA
N'T READ HIEROGIYPHICS!":EXEC32226:SOUND10,90:GOTO470
1890 IF LEFT$(N$,3)="WALL" OR LEFT$(N$,3)="WRI" THEN PRINT@449,"IT SAYS : 'GOLD-
SILVER-COPPER'":EXEC32226:SOUND10,10:GOTO470
1900 GOTO1870
1910 IF N$="" THEN 420
1920 IF LEFT$(N$,3)="SCR" OR LEFT$(N$,3)="WALL" OR LEFT$(N$,3)="BOU" THEN 1830
1930 IF R=68 AND LEFT$(N$,3)="PED" THEN PRINT@449,"THERE'S A SMALL HOLE!":EXEC32
226:SOUND10,90:GOTO470
1940 PRINT@449,"YOU SEE NOTHING SPECIAL!":EXEC32226:SOUND10,50:SOUND40,60:SOUND8
0,70:GOTO470
1950 IF RND(2)()2 THEN PRINT@449,"NOT NOW!":EXEC32226:SOUND30,30:GOTO470
1960 IF R(5 OR (R)5 AND R(10) THEN PRINT@449,"LOST? KEEP TYING!":EXEC32226:SOUND
40,30:GOTO470
1970 IF R=13 THEN PRINT@449,"TRY THE FRUIT!":EXEC32226:SOUND50,70:GOTO470
1980 IF R=14 THEN PRINT@449,"WHAT ABOUT THE BOULDER?":EXEC32226:SOUND10,20:GOTO4
70
1990 IF R=21 THEN PRINT@449,"SOME LIGHT MIGHT HELP.":EXEC32226:SOUND10,30:GOTO47
0
2000 IF R=29 THEN PRINT@449,"KILL THE MUMMY.":SOUND10,20:EXEC32226:GOTO470
2010 IF R=36 OR R=45 THEN PRINT@449,"WON'T OPEN? UNLOCK IT!":EXEC32226:SOUND10,1
0:GOTO470
2020 IF R)37 AND R(42 THEN PRINT@449,"EXITS ARE NOT ALWAYS OBVIOUS.":EXEC32226:S
OUND10,30:GOTO470
2030 IF R=53 THEN PRINT@449,"DO SOMETHING, QUICKLY!":EXEC32226:SOUND10,20:GOTO47
0
2040 IF R=50 THEN PRINT@449,"SOMETHING ELSE MAY HELP.":EXEC32226:SOUND10,10:GOTO
470
2050 IF R=68 THEN PRINT@449,"TRY THE PEDISTAL.":EXEC32226:SOUND10,20:GOTO470
2060 PRINT@449,"I CAN'T HELP YOU HERE!":EXEC32226:SOUND40,90:GOTO470
2070 PRINT@449,"DO YOU WISH TO SAVE YOUR":SOUND10,10:EXEC32226:PRINT@449,"CURREN
T POSITION ??":SOUND10,10
2080 POKE65494,0
2090 A$=INKEY$:IF A$="" THEN 2090
2100 IF A$="Y" THEN A=0:SOUND50,50:PRINT@467,A$:GOTO2130
2110 IF A$="N" THEN A=-1:SOUND50,50:PRINT@467,A$:GOTO2130
2120 GOTO2090
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(continued on next page)

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2130 A$=INKEY$:IF A$="" THEN 2130
2140 IFA$=CHR$(13) THEN SOUND30,90:GOTO2170
2150 IF A$=CHR$(8) THEN SOUND40,10:PRINT@467,"?":GOTO2090
2160 GOTO2130
2170 EXEC32226
2180 IF A=-1 THEN GOTO 2320
2190 PRINT@449,"PLEASE POSITION THE TAPE.":EXEC32226:SOUND10,10:PRINT@449,"PRESS
 A KEY :";:SOUND10,10:MOTOR ON:AUDIO ON
2200 A$=INKEY$:IF A$="" THEN 2200
2210 PRINTA$;:EXEC32226:MOTOR OFF:AUDIO OFF
2220 PRINT@449,"PRESS RECORD.":SOUND40,80:EXEC32226:PRINT@449,"PRESS A KEY :";:S
OUND10,10
2230 A$=INKEY$:IF A$="" THEN 2230
2240 PRINTA$;:EXEC32226
2250 PRINT@449,"SAVING....":SOUND40,90:EXEC32226
2260 OPEN"O",#-1,"DATA"
2270 PRINT#-1,R,I,MU,CR,CC,P,PP,T,M,MM,L,G
2280 FORA=1 TO25:PRINT#-1,NP(A):NEXTA
2290 CLOSE#-1
2300 PRINT@449,"DONE":SOUND30,50:EXEC32226
2310 GOTO420
2320 A=0:PRINT@449,"DO YOU WISH TO LOAS A GAME :?";:SOUND10,10
2330 A$=INKEY$:IF A$="" THEN 2330
2340 IF A$="N" THEN PRINTCHR$(8);A$:A=-1:GOTO2370
2350 IF A$="Y" THEN PRINTCHR$(8);A$:GOTO2370
2360 GOTO2330
2370 SOUND30,80
2380 A$=INKEY$:IF A$="" THEN 2380
2390 IF A$=CHR$(8)THEN GOTO 2320
2400 IF A$=CHR$(13) THEN 2420
2410 GOTO2380
2420 SOUND40,20:EXEC32226
2430 IF A=-1 THEN PRINT@449,"VERY WELL.":EXEC32226:FORA=20 TO 40:SOUNDA,50:NEXTA
:GOTO3780
2440 PRINT@449,"SEARCHING....":EXEC32226:SOUND10,10
2450 OPEN"I",#-1,"DATA"
2460 PRINT@449,"LOADING....":EXEC32226:SOUND10,10
2470 INPUT#-1,R,I,MU,CR,CC,P,PP,T,M,MM,L,G
2480 FORA=1 TO 25:INPUT#-1,NP(A):NEXTA
2490 CLOSE#-1:PRINT@449,"DONE":EXEC32226:SOUND20,20:GOTO420
2500 IF N$="" THEN PRINT@449,"FIT WHAT?":EXEC32226:SOUND40,10:GOTO470
2510 IF R<>68 THEN PRINT@449,"YOU CAN'T!":EXEC32226:SOUND90,40:GOTO470
2520 IF NP(18)<>-2 THEN PRINT@449,"YOU CAN'T!":EXEC32226:SOUND40,90:GOTO470
2530 PRINT@449,"IT FITS INTO THE HOLE!":EXEC32226:SOUND10,10:SOUND20,20:SOUND30,
30:PRINT@449,"WITH A CRASH THE CRYSTAL":EXEC32226:SOUND20,20:PRINT@449,"SHATTERS"
!":EXEC32226:FORA=30 TO 1 STEP-1:SOUNDA,A:NEXTA:NP(17)=R:GOTO470
2540 IF N$="" THEN PRINT@449,"HUH!":EXEC32226:SOUND100,40:GOTO470
2550 IF LEFT$(V$,3)="HIT" AND LEFT$(N$,3)="DRU" THEN 1420
2560 IF R=53 AND LEFT$(N$,3)="CRO" THEN PRINT@449,"IT DOSEN'T LIKE THAT!":EXEC32
226:SOUND20,70:SOUND70,70:GOTO470
2570 IF R=29 ANDLEFT$(N$,3)="MUM" THEN PRINT@449,"IT DOSEN'T LIKE THAT!":SOUND50
,50:SOUND30,50:EXEC32226:GOTO470
2580 PRINT@449,"YOU CAN'T!":SOUND40,80:EXEC32226:GOTO470
2590 IF N$="" THEN PRINT@449,"DIG WHAT?":SOUND40,80:EXEC32226:GOTO470
2600 IF LEFT$(N$,3)<>"HOL" THEN PRINT@449,"YOU CAN'T!":SOUND90,80:EXEC32226:GOTO
470
2610 IF NP(20)<>-2 THEN PRINT@449,"WITH WHAT?":EXEC32226:SOUND50,70:GOTO470
2620 IF R<>66 THEN PRINT@449,"WHY?!":SOUND20,60:EXEC32226:GOTO470
2630 PRINT@449,"THE SAND POURED INTO YOUR":SOUND10,10:EXEC32226:PRINT@449,"HOLE
AND COVERED YOU!!":SOUND40,90:GOTO3770
2640 IF N$="" THEN PRINT@449,"OIL WHAT?":EXEC32226:SOUND65,85:GOTO470
2650 IF NP(22)<>-2 THENPRINT@449,"WITH WHAT?":SOUND30,60:EXEC32226:GOTO470
2660 IF R<>50 THEN PRINT@449,"WHAT GOOD DID THAT DO?!":SOUND50,90:EXEC32226:NP(2
2)=-1:I=I-1:GOTO470
2670 IF LEFT$(N$,3)<>"DOO" THEN PRINT@449,"WHAT GOOD DID THAT DO?!":SOUND40,70:E
XEC32226:NP(22)=-1:I=I-1:GOTO470
2680 PRINT@449,"THE DOOR CREAKS OPEN!":SOUND4000,5:EXEC32226:D(50,2)=49:GOSUB372
0:NP(22)=-1:I=I-1:GOTO470
2690 IF N$="" THEN PRINT@449,"FEED WHAT?":EXEC32226:SOUND50,20:GOTO470
2700 IF LEFT$(N$,3)="MON" AND NP(21)=-2 AND NP(3)=-2 AND MM<10THEN PRINT@449,"TH
E MONKEY RECOVERS QUICKLY":EXEC32226:SOUND10,10:PRINT@449,"AND RUNS OFF!":SOUND4
0,60:EXEC32226:NP(21)=-1:NP(3)=-1:I=I-2:GOTO470
2710 IF LEFT$(N$,3)="CRO" AND NP(21)=-2 AND MM>10 AND R=53 THEN PRINT@449,"THE C
ROCODILES DEVOUR THE":EXEC32226:SOUND10,10:PRINT@449,"MONKEY THEN SLINK OFF INTO
":EXEC32226:SOUND10,10:PRINT@449,"THE DARKNESS.":EXEC32226:SOUND10,10:CR=-1:D(53
,1)=57:A=-1
2720 IF A=-1 THEN GOSUB3720:NP(21)=-1:GOTO470
2730 PRINT@449,"YOU CAN'T!":SOUND90,90:EXEC32226:GOTO470
2740 IF N$="" THEN PRINT@449,"SAY WHAT?":EXEC32226:SOUND10,70:GOTO470
2750 IF LEFT$(N$,3)="ABU" THEN PRINT@449,"THE SKY DARKENS AND THE GROUND":EXEC32
226:SOUND10,10:PRINT@449,"TREMBELS FOR A SECOND!":EXEC32226:SOUND5000,10:GOTO470
2760 PRINT@449,"OK.":EXEC32226:SOUND50,70:GOTO470
2770 STOP
2780 PRINT@449,"YOU'VE GOT :"
2790 X=0
2800 FORA=1 TO 25
2810 IF NP(A)=-2 THEN X=X+1:PRINT@461,N$(A):EXEC32226:SOUND80,80
2820 NEXTA
2830 IF X=0 THEN PRINT@461,"NOTHING!":SOUND40,10:SOUND40,20:SOUND40,30:EXEC32226
2840 GOTO470
2850 DATAIN AN ENDLESS SANDY DESERT. THE SUN IS SHINNING VERY BRIGHTLY AND YOU S
EE AN OASIS IN THE DISTANCE.
2860 DATAIN AN OASIS WITH PALM TREES GROWING AROUND A POOL OF CLEAR WATER.
2870 DATAON THE SEA SHORE. A PEBBLY BEACH RUNS DOWN INTO THE BLUE SEA. A PATH LE
ADS EAST AWAY FROM THE SEA.
2880 DATAAT THE EDGE OF A VAST SANDY DESERT. NEARBY IS A CROSS ROADS OF DIRT PAT
HS WITH ONE OF THEM LEADING STRAIGHT INTO THE SANDY WASTE.
2890 DATAIN A SMALL MUD HUT WITH A THATCHED ROOF. THERE IS A DOOR IN THE WEST WA
LL AND A SIGN IS STUCK IN THE GROUND.
2900 DATAIN A SMALL WALLED COURTYARD WITH A LARGE FIG TREE GROWING IN THE MIDDLE
. THE TREE IS LOADED WITH LUSCIOUS FRUIT.
2910 DATAAT THE NORTH END OF A RIVER VALLEY. A HUGE BOULDER COVERED WITH HIEROGL
YPHICS CONFRONTS YOU.
2920 DATAIN A SMALL DIRT CAVE WITH TREE ROOTS HANGING DOWN FROM THE ROOF. SMALL
ROCKS ARE SCATTERED AROUND ON THE FLOOR.
2930 DATAON A PEBBLY BEACH WITH HIGH CLIFFS RISING UP BEHIND. THE SHORE STRETCHE
S NORTH-SOUTH.
2940 DATAON A NARROW DIRT PATH RUNNING ALONG THE TOP OF SOME HIGH CLIFFS. THE PA
TH RUNS NORTH-SOUTH AND A JUNCTION LEADS EAST INTO THE DENSE BUSH.
2950 DATAWALKING ALONG A WORN TRAIL IN THE DENSE BUSH LAND. THE TRAIL TWISTS EAS
T AND WEST AND THERE IS A CLEARING TO THE SOUTH.
2960 DATAWALKING ALONG A DRIED UP RIVER BED. THE SIDES AND BOTTOM ARE CRACKED AN
D PARCHED. A CARVED STONE STAIRWAY LEADS AWAY NORTH AND THE RIVER BED STRETCHES
EAST-WEST.
2970 DATAIN A DUSTY RIVER VALLEY WITH HIGH CLIFF SIDES. IT WINDS NORTH-SOUTH AND
 A PATH LEADS WEST.
2980 DATAON A BEACH IN FRONT OF A LARGE DARK OPENING IN THE SOUTH CLIFF WALL.
2990 DATAAT THE END OF THE CLIFF PATH. THICK BUSH SURROUNDS YOU TO THE EAST & SO
UTH. THE CLIFF FALLS SHARPLY DOWN TO THE WEST.
3000 DATAIN A SMALL CLEARING WITH DENSE SCRUB ALL AROUND. A LARGE DEAD TREE IS L
YING TO THE SOUTH AND A TRAIL LEADS NORTH.
3010 DATAAT A HUGE HIDEOUS FACE CARVED INTO A CLIFF WALL. A TUNNEL LEADS THROUGH
 ITS SHARP TOOTHED MOUTH INTO DARKNESS.
3020 DATAAT THE SOUTH END OF A RIVER VALLEY. THE HIGH CLIFF FACES TOWER ABOVE YO
U AND THE ONLY WAY IS NORTH.
3030 DATAIN A SMALL TWISTING TUNNEL. THE WALLS ARE CARVED OUT OF ROCK AND THE AI
R IS STALE AND DANK. PASSAGES LEAD NORTH SOUTH & EAST.
3040 DATAIN A NARROW TUNNEL LEADING EAST-WEST. A SMALL OPENING LEADS SOUTH AND T
HE WALLS ARE DAMP.
3050 DATAAT A TURNING IN THE TUNNEL. THE ROOF IS DRIPPING WITH WATER AND AN EERI
E NOISE WHISTLES THROUGH THE CAVE.
3060 DATAINSIDE THE DOORWAY TO A TOMB. MASSIVE SUPPORTS HOLD THE BULGING ROOF UP
 AND THE FLOOR IS COVERED WITH A THICK LAYER OF DUST.
3070 DATAIN A ROUND DOME SHAPED CAVERN. THERE ARE SMALL HOLES IN THE CENTRE OF T
HE ROOF AND FLOOR. A LARGE WOODEN DOOR IS SET IN THE SOUTH WALL.
3080 DATAIN A HIGH ROOFED CAVERN WITH ROCKS AND DEBRIS LITTERING THE FLOOR. THE
CAVE WINDS NORTH-SOUTH.
3090 DATAIN WHAT LOOKS LIKE A STORE ROOM CARVED OUT OF THE ROCK. BOXES AND BARRE
LS ARE STACKED HIGH ALL AROUND THE WALLS.
3100 DATAIN A GIANT HIGH VAULTED CAVERN. STALAGTITES HANG OMINOUSLY FROM THE CEI
LING AND MUFFLED BOOMING NOISES COME FROM THE BLACKNESS BEYOND YOUR LIGHT.
3110 DATAIN A SMALL CARVED CAVE. A HUGE IDOL HAS BEEN SCULPTURED FROM A GIANT ST
ALAGMITE IN THE CENTRE OF THE ROOM.
3120 DATASURROUNDED BY WATER IN A VAULTED CAVE WITH A PASSAGE HIGH UP IN THE EAS
T WALL. A WATERY PASSAGE RUNS WEST OUT INTO DAYLIGHT.
3130 DATAIN A SQUARE CUT CAVERN WITH OLD ROTTING TWIGS LYING SCATTERED ON THE FL
OOR. A SMALL IRON RUNG CHEST SITS IN THE CORNER.
3140 DATAIN A SMALL CAVITY WITH LARGE CRACKS RUNNING FROM FLOOR TO CEILING. LARG
E BOULDERS AND ROCKS LITTER THE FLOOR.
3150 DATAIN A STONE WALLED ROOM WITH A ROW OF BRIGHTLY PAINTED SARCOPHAGII STAND
ING ALONG THE NORTH WALL. THE DOOR WAY LEADS SOUTH.
3160 DATAIN A ROOM WITH SHINNING GOLD LINED WALLS. A GREAT GOLD THRONE STANDS IN
 THE CENTRE AND WIERD WRITING IS MARKED HERE AND THERE.
3170 DATAIN A LARGE WOODEN PANNELED ROOM WITH COLOURFUL TILES SET IN THE FLOOR A
ND CEILING.
3180 DATAIN A CRUMBLING STONE LINED CHAMBER. RUSTY CHAINS HOLD AN OLD WHITE BONE
D SKELETON TO THE WALL AND A HUGE IRON DOOR BARS THE WAY EAST.
3190 DATAIN A SMALL SQUARE ROOM WITH A MANHOLE IN THE CEILING. A LARGE IRON STUD
DED DOOR IS IN THE WEST WALL.
3200 DATAIN A CHAMBER WITH PAINTINGS OF EGYPTIAN LIFE ON THE WALLS FLOOR AND CEI
LING. A DOOR WAY FACES WEST.
3210 DATAYOU ARE INSIDE THE TREASURE ROOM! THE GOLDEN MASK LIES BEFORE YOU ON A
SHINING MAT. YOU GRASP IT IN YOUR HANDS AND A SUDDEN LOW BOOMING AND RUMBLING NO
ISE SHUDDERS THE WHOLE ROOM. BEWARE THE CURSE OF ABU SIMBEL.
3220 DATAIN A LARGE CHAMBER WITH FOUR DOOR WAYS IN IT. THE WEST DOOR IS A MASSIV
E AFFAIR WITH A HUGE THREE KEY LOCK IN IT.
3230 DATAAT THE WEST END OF A GREAT DECORATED HALL. MARBLE PILLARS LINE THE WALL
S AND WOOD AND CHIPPINGS LIE SCATTERED ON THE FLOOR.3240 DATAAT THE EAST END OF
A MARBLE PILLAR LINED HALL. GREAT TILE PICTURES ARE SET IN THE FLOOR & CEILING.
DEBRIS LIES ALL AROUND THE FLOOR.
3250 DATAIN A STEEPLY SLOPING TUNNEL THAT TURNS AND TWISTS SHARPLY. THE WALLS AR
E DECORATED LAVISHLY WITH PAINTED FIGURES AND ANIMALS.
3260 DATAIN A TINY CELL LIKE ROOM. DARK STAINS SPOIL THE WALLS FLOOR AND ROOF.
3270 DATAIN A SMALL THIN CORRIDOR WITH HEAVY WALLS BEARING DOWN ON EITHER SIDE.
A THICK WOODEN DOOR WITH AN IRON GRILL IN IT IS AT THE END.
3280 DATAAT A CROSSROADS OF CORIDORS. PASSAGES LEAD NORTH EAST & WEST. AN IRON P
ORTCULLIS BLOCKS THE PASSAGE SOUTH AND TWO LEVERS ARE SET IN THE WALL BESIDE IT.
3290 DATAIN A PASSAGE LEADING DOWNWARDS THAT STOPS SHORT. IT LOOKS AS IF THE ROO
F HAS FALLEN IN AND BLOCKED THE PASSAGE.
3300 DATAIN A ROOM WITH A SUNKEN FLOOR. THERE ARE POOLS OF WATER AND TWO HUGE GR
EEN FIERCE LOOKING CROCODILES STARE AT YOU BLOCKING THE WAY ACROSS THE ROOM.
3310 DATAIN A SMALL SMOOTH WALLED CHAMBER. THERE ARE BENCHES AROUND THE WALLS AN
D A DOOR LEADS SOUTH.
3320 DATAIN A NARROW TWISTING TUNNEL. SET IN THE WALLS ARE SHINING STONES AND PA
SSAGES LEAD EAST WEST & NORTH.
3330 DATAIN A NARROW TWISTING TUNNEL. SET IN THE WALLS ARE SHINING STONES AND PA
SSAGES LEAD EAST WEST & NORTH.
3340 DATAIN A NARROW TWISTING TUNNEL. SET IN THE WALLS ARE SHINING STONES AND PA
SSGES LEAD EAST WEST & NORTH.
3350 DATAIN A LARGE GRAND ROOM. A SQUARE POOL OF BLUE LIQUID IS SET IN THE MIDDL
E OF THE FLOOR. ARCHED DOORS LEAD OFF NORTH SOUTH & WEST.
3360 DATAIN A SMALL CELLAR. THE AIR IS VERY COLD AND OPEN BOXES ARE STREWN ACROS
S THE FLOOR.
3370 DATAIN A CHAMBER WITH STONE SLABS LINING THE WALLS. SOME ARE CRACKED AND BR
OKEN AND PASSAGES LEAD IN ALL DIRECTIONS.
3390 DATAIN A WOODEN ROOM WITH SHELVES STOCKED HIGH WITH ALL KINDS OF JARS BOTTL
ES POTS AND VASES.
3400 DATAIN A SMALL SMOOTH WALLED CHAMBER. THERE ARE BENCHES AROUND THE WALLS AN
D A DOOR LEADS NORTH.
3410 DATAIN A ROCK CUT TUNNEL. LARGE CRACKS APPEAR IN THE FLOOR AND IT FEELS EXT
REMELY UNSAFE.
3420 DATAAT A SMALL CAVE HEWN OUT OF THE ROCK. STRANGE WRITING COVERS THE WALLS
AND A PASSAGE LEADS EAST.
3430 DATAIN A TWISTING ROCK CUT TUNNEL. LARGE CRACKS APPEAR IN THE FLOOR AND IT
FEELS EXTREMELY UNSAFE.
3440 DATAIN A CAVE WITH A SANDY FLOOR. THE DOME SHAPED ROOF IS CRACKED AND LOOKS
 NON TOO SAFE.
3450 DATAAT THE END OF A TWISTING ROCK CUT TUNNEL. LARGE CRACKS APPEAR IN THE FL
OOR AND IT FEELS EXTREMELY UNSAFE.
3460 DATAIN A STRANGELY SHAPED FIVE WALLED ROOM. STARS AND MOONS ARE PAINTED ON
THE FLOOR AND IN THE CENTRE STANDS A CRYSTAL PEDESTAL.
3470 DATA2,4,4,2,3,0,1,3,6,0,2,3,1,7,7,5,2,8,4,6,3,9,0,9,4,11,7,8,5,9,7,9,6,9,8,9
3480 DATA0,16,0,11,7,17,10,12,0,0,11,0,0,19,0,0,0,20,0,0,0,0,14,0,10,21,0,0,11,2
2,0,18,0,23,17,19,13,24,18,20,14,25,19,0
3490 DATA16,0,0,0,17,0,0,0,18,0,0,0,19,29,0,0,20,0,0,0,21,30,0,27,0,31,26,28,0,3
4,27,0,24,0,0,0,26,0,0,0,27,33,0,0
3500 DATA30,0,0,0,31,36,0,34,28,37,33,0,0,0,16,0,33,0,35,37,34,0,36,0
3510 DATA0,41,0,0,0,0,0,40,0,0,0,41,38,0,40,0,0,45,41,43,0,0,42,0,0,0,0,0,42,51,
0,46,0,0,45,47,0,53,46,48,29,0,47,0
3520 DATA0,0,0,50,0,0,0,51,45,0,50,52,0,0,51,0,47,0,0,0,0,58,0,0,55,0,55,56,56,0
,55,57,53,0,56,58,54,62,57,0
3530 DATA0,0,0,60,51,63,59,61,0,0,60,0,58,0,0,0,60,65,0,0,0,0,0,65,63,67,64,0,0,
0,0,67,65,68,66,0,67,0,0,0
3540 DATAGO,TAKE,GET,DROP,SWIM,PUSH,PULL,BREAK,SMASH,BEAT,SHAKE,LOAD,SHOOT,LIGHT
,OPEN,UNLOCK,READ,EXAMINE,LOOK,HELP,QUIT,FIT,KILL,HIT,STAB,DIG,OIL,FEED,THROW,SA
Y,INVENTORY
3550 DATAA SMALL KNIFE,10,A DRUM,12,A FIG,0,A FLINT BOX,0,A LANTERN,15,A VASE,46
,A RUSTY KEY,5,A SCROLL,18,A ROPE,19,A PAINTED SHIELD,52,A PIECE OF WOOD,25,A GU
N,32,SOME BULLETS,0,AN IRON ROD,39,A GOLD KEY,0,A SILVER KEY,0,A COPPER KEY,0,ST
ONE CYLINDER,4
3560 DATAA BLUE JAR,61,A SPADE,66,A SICK MONKEY,23,A GREEN JAR,61
3570 PRINT@106,"";:PRINTUSING"##:##:##";PEEK(32222);PEEK(32223);PEEK(32224);:RET
URN
3580 C$="":W$=""
3590 A$=A$+" "
3600 PRINT@449,"YOU ARE ";
3610 FORA=1 TO LEN(A$)
3620 C$=MID$(A$,A,1)
3630 IF C$=" " THEN GOSUB3680
3640 W$=W$+C$
3650 NEXTA
3660 SOUND20,10
3670 RETURN
3680 IF POS(0)+LEN(W$)>31 THEN EXEC32226:PRINT@448,W$;:POKE1472,149ELSEPRINTW$;
3690 IF RIGHT$(W$,1)="." THEN EXEC32226:PRINT@450,"";:POKE1472,149
3700 W$=""
3710 RETURN
3720 PRINT@28,STRING$(3,128);:PRINT@61,CHR$(204);:PRINT@59,CHR$(128);:PRINT@63,C
HR$(128);:PRINT@92,CHR$(202);CHR$(128);CHR$(197);:PRINT@123,CHR$(128);:PRINT@12
5,CHR$(195);:PRINT@127,CHR$(128);:PRINT@156,STRING$(3,128);
3730 IFD(R,0)>0 THEN PRINT@28,CHR$(193);CHR$(128);CHR$(194);:PRINT@61,CHR$(128);
3740 IFD(R,1)>0 THEN PRINT@156,CHR$(196);CHR$(128);CHR$(200);:PRINT@125,CHR$(128);
3750 IF D(R,2)>0 THEN PRINT@59,CHR$(193);:PRINT@123,CHR$(196);:PRINT@92,CHR$(128);
3760 IF D(R,3)>0 THEN PRINT@63,CHR$(194);:PRINT@94,CHR$(128);:PRINT@127,CHR$(200);
3770 RETURN
3780 PRINT@449,"I'M AFRAID THAT YOU'RE":EXEC32226:SOUND20,20:PRINT@449,"SLIGHTLY
 DEAD!":EXEC32226
3790 FORA=100 TO 300 STEP 5:SOUNDA,5:NEXTA
3800 FORA=1TO600:NEXTA
3810 PRINT@449,"DO YOU WISH TO START AGAIN :?":SOUND10,20
3820 A$=INKEY$
3830 IF A$="Y" OR A$="N" THEN PRINT@477,A$:SOUND30,60:GOTO3850
3840 GOTO3820
3850 B$=INKEY$
3860 IF B$=CHR$(13) THEN SOUND40,50:GOTO3880
3870 IF B$=CHR$(8) THEN PRINT@477,"?":SOUND70,70:GOTO3820
3875 GOTO3850
3880 IF A$="N" THEN CLS0:GOTO3880
3890 RUN
9000 FORA=0TO511:POKE1024+A,PEEK(1536+A):NEXT
9010 POKE2300,PEEK(25):POKE2301,PEEK(26):POKE2302,PEEK(27):POKE2303,PEEK(28)
9020 CSAVEM"ADV",150,PEEK(27)*256+PEEK(28),0
9030 POKE25,PEEK(2300):POKE26,PEEK(2301):POKE27,PEEK(2302):POKE28,PEEK(2303)
9040 RUN
```

For home or business the IBM compatible

Advance 86a



16 Bit Micro-Computer

Under £350*

For the home user start with Model A with its massive 144K RAM and outstanding typewriter style keyboard that fits within the base unit for portability and storage.
Note the large return key and position of the numeric keyboard. Fast retrieval from storage and fast action on games is achieved by the use of the Intel 8086 True 16-bit micro-processor running at 4.77 MHz.
The Advance 86 runs IBM PC software.

Specification

CPU Type	True 16-bit 8086 running at 4.77 MHz.
RAM	128K or 256K with parity plus 16K video
Languages Included	Basic
Type of Keyboard	Full 84 keys tactile
Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
Cassette Recorder	Audio
Interfaces Included	Cassette port, light pen, joystick, Centronics
Sound	Built-in speaker
Operating System	Built-in ROM
Printers	Any using Centronics parallel interface
Comments	Hardware and software compatible with IBM PC Upgradeable to Model B Provision for 8087 Arithmetic Processor
Warranty	12 months



The business user can upgrade to Model B by adding the Advance Expansion box containing 2 × 5.25" disc drives providing 720K storage at £956.52 + VAT.
The Advance 86 Model B offers the business micro-computer buyer an IBM compatible disk-based system with twin drives, with Perfect Writer/Speller, Calc and Filer Software (MS/DOS) included for only £1303.48 + VAT.

Advance 86 Models A & B are designed and marketed by Advanced Technology UK Ltd. Made by FERRANTI in Oldham. Delivery within 30 days from receipt of payment. 128K memory expansion £108.70 + VAT.

Advance Technology UK Ltd.
8A Hornsey Street, London N7 8ZHB
Tel: 01-609 0061 for leaflet:

On site warranty for 12 months by National Advanced Systems (part of National Semiconductor) one of the largest companies in the U.S.A. for 86B.

*Ex VAT.

Benchmarks

The standard Benchmarks were run using Advance Basic, which is the equivalent of Microsoft GWBasic and Basica on the IBM PC.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Advance 86 — 8086	0.8	3.3	7.3	7.4	8.1	14.6	23.9	26.0	11.4
ACT Apricot — 8086	1.6	5.2	10.6	11.0	12.4	22.9	35.4	34.4	16.7
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

To Advance Technology UK Ltd., 8A Hornsey Street, London N7 8HB

☐ Please send Model 86A, Micro-Computer & Keyboard I enclose £399 including VAT
☐ Please send Model 86B which includes Model 86A plus Expansion Box & Software. I enclose £1499 inc. VAT.
☐ Please send 128K Memory Expansion £125 inc. VAT. Cheque/Barclaycard/Access No. ______

Name ______ Company ______
Address ______ Address ______

YC

AMSTRAD WORD PROCESSOR

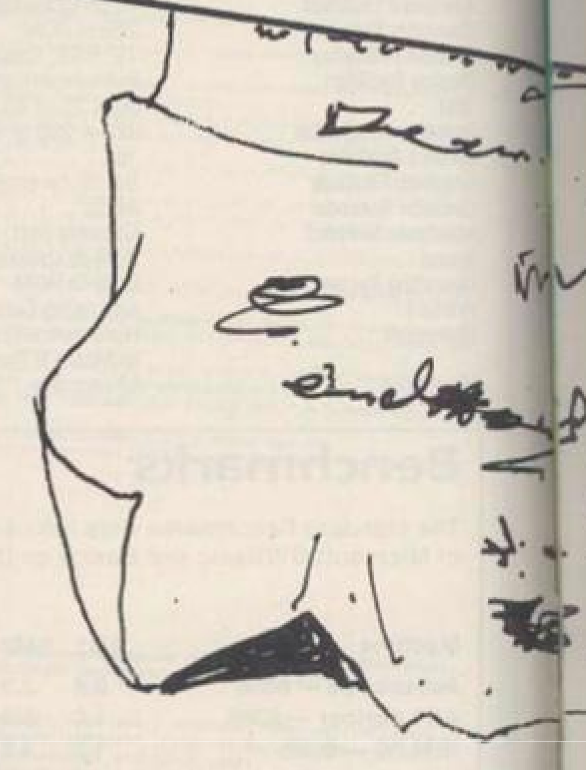
Roger Hammond gives you a large range of options for printing pages, quitting, scrolling, or cataloguing the tape

Listing 1. The loader program.

```
10 MEMORY 35999
20 ZONE 6
30 FOR I=36000 TO 36266
40 PRINT I,:INPUT X%
50 POKE I,X%
60 NEXT I
70 FOR X=36000 TO 36260 STEP 10
80 PRINT X,
90 FOR I=0 TO 9
100 PRINT PEEK(X+I),
110 NEXT I
120 PRINT
130 NEXT X
140 INPUT "IS THIS CORRECT? (Y/N)";Q$
150 IF Q$="y" OR Q$="Y" THEN 190
160 IF Q$<>"N" AND Q$<>"n" THEN 140
170 INPUT "enter address and correct
    value seperated by a comma";ad,x%
180 POKE ad,x%:GOTO 70
190 INPUT "ENTER FILENAME";N$
200 SAVE N$,B,36000,267
```

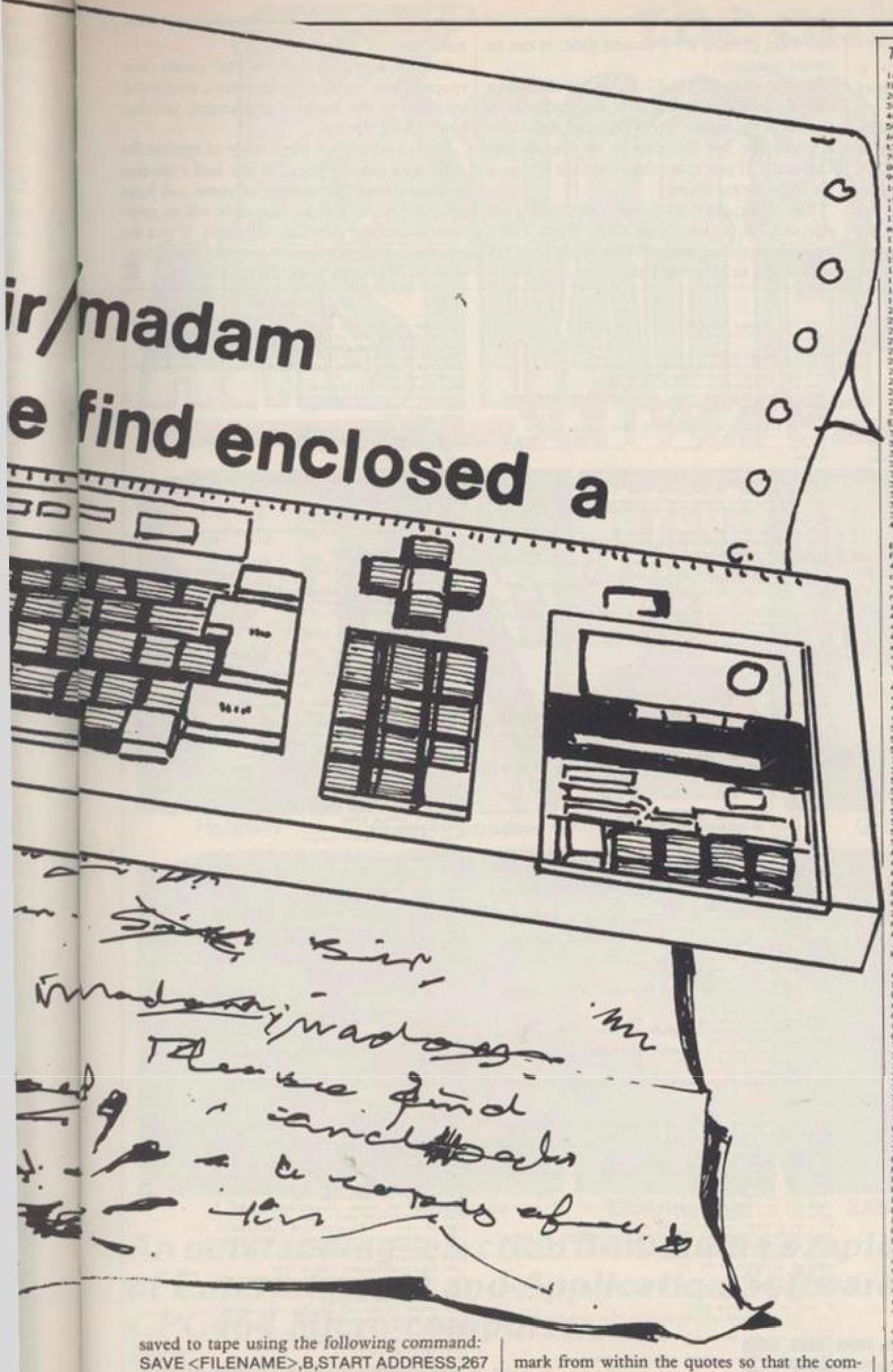
The machine code.

36000	33	32	78	1	127	62	54	32	35	13
36010	32	250	14	0	5	32	245	201	42	189
36020	77	1	64	7	62	32	119	35	13	32
36030	251	14	0	5	32	246	201	42	189	77
36040	1	64	7	126	205	90	187	35	13	32
36050	248	14	0	5	32	243	201	17	96	134
36060	42	191	77	14	20	58	194	77	71	126
36070	18	19	35	16	250	58	193	77	71	35
36080	16	253	13	32	236	17	112	148	33	112
36090	148	14	3	58	194	77	71	126	18	35
36100	19	16	250	58	193	77	71	35	16	253
36110	13	32	236	237	91	196	77	42	196	77
36120	58	195	77	71	43	16	253	237	75	198
36130	77	237	184	235	19	33	112	148	237	75
36140	195	77	6	0	237	176	237	91	191	77
36150	33	96	134	14	20	58	194	77	71	126
36160	18	19	35	16	250	58	193	77	71	19
36170	16	253	13	32	236	201	33	112	148	6
36180	240	54	32	35	16	251	201	17	96	134
36190	42	191	77	14	20	58	194	77	71	126
36200	18	19	35	16	250	58	193	77	71	35
36210	16	253	13	32	236	237	75	198	77	237
36220	91	200	77	42	202	77	237	176	58	204
36230	77	71	54	32	43	16	251	237	91	191
36240	77	33	96	134	14	20	58	194	77	71
36250	126	18	19	35	16	250	58	193	77	71
36260	19	16	253	13	32	236	201	0	0	0



ROBWRITE IS a word-processing program that allows the user to Save and Load files, use different sizes of text if his printer permits, change margins, access nine different pages of 20 lines which can easily be printed consecutively and exercise full editing functions. It has been written for an Epson RX-80 F/T but should run on most printers with little alteration.

The machine code should be entered and saved to tape first as the program will probably crash if it is not present. Listing 1 will load this if you enter the values given in the decimal dump. The machine code should be



saved to tape using the following command:
SAVE <FILENAME>,B,START ADDRESS,267

Do not try calling the machine code other than from the main program as it uses variables Poked from Basic.

Once the machine code is in memory and has been saved, enter the Basic program. The program will normally load the code itself when it is run but, during development, if you are sure that the code is present above Himem it may be a good idea to turn line 290 into a Rem statement or to remove the exclamation mark from within the quotes so that the computer will warn you that it is about to attempt to load.

When you have debugged the program save it with the machine code after it, making certain that line 290 is back to its original form.

There are about two kilobytes left free in Basic for any additions you may feel like adding and the area above Himem from 36267 to 37999 is also free.

(continued on next page)

The main program.

```
10 REM*******************************************ROBWRI
TE************************
20 SPEED WRITE 1
30 OPENOUT "dummyfile"
40 MEMORY 19000
50 CLOSEOUT
60 EMPHASIS%=1:STRIKE%=1:TYPE%=1:SET%=1:SPACE%=6:inser
t%=1
70 BOTTOM%=20
80 DIM xtab%(80):FOR i=1 TO 80:xtab%(i)=0:NEXT
90 MODE 2:ZONE 80:INK 0,10:BORDER 10:INK 1,24
100 WINDOW #0,1,80,1,22:WINDOW #1,1,80,22,25:WINDOW #2
,60,70,25,25
110 PRINT"robwrite2",,"by Robin J.R. Hammond.",....
120 PRINT"use the following keys to control the progra
m:",,
130 ZONE 30
140 PRINT"ARROWS","to move the cursor"
150 PRINT"DEL","to delete text"
160 PRINT"ENTER","for carriage return"
170 PRINT "TAB ","to move to the next tab position"
180 PRINT"CTRL and TAB","to set a tab position"
190 PRINT "CLR","to clear all tab stops"
200 PRINT"CTRL and ";CHR$(93),"to enter delete mode"
210 PRINT "CTRL and ";CHR$(91),"to enter insert mode"
220 PRINT"COPY","to display options",,
230 ZONE 80
240 PRINT #1,"PLEASE WAIT"
250 LOAD "!",36000
260 CLS #1
270 PRINT ....,"PRESS ANY KEY TO CONTINUE..."
280 IF INKEY$="" THEN 280
290 WIDTH 80
300 CLS:PRINT CHR$(7);:PRINT "PLACE THE PRINTER ON LIN
E."
310 PRINT #8,CHR$(27);"@";:CLS
320 PRINT #8,CHR$(27);"E";
330 PRINT #8,CHR$(27);"G";
340 PRINT #8,CHR$(27);"A";CHR$(SPACE%);
350 PRINT #8,CHR$(27);"P";
360 PRINT #8,CHR$(27);"C";CHR$(0);CHR$(11);
370 PRINT #8,CHR$(27);"N";CHR$(12);
380 PRINT #8,CHR$(13);
390 PRINT"Current printer settings are:",....
400 PRINT"PICA SIZED PRINT","EMPHASIZED PRINT","DOUBLE
 STRIKE ON","6/72 INCH LIN
E SPACING","11 INCH PAPER LENGTH","1 INCH SKIP OVER PE
RFORATION SETTING"
410 PRINT,...,"These may be changed at any time during
operation of the program b
y pressing    COPY and selecting the appropriate optio
n.  Changing any setting w
ill however   cause the paper to move up slightly."
420 PRINT,,,"PRESS ANY KEY TO CONTINUE..."
430 IF INKEY$="" THEN 430
440 PRINT CHR$(7);:CLS:PRINT #1,"Do you want standard
margins?  Press Y or N"
450 q$=INKEY$:IF q$="" THEN 450 ELSE IF q$="y" OR q$="
Y" THEN GOSUB 3370 ELSE IF
 q$="n"OR q$="N" THEN GOSUB 3390 ELSE 450
460 CLS #1
470 POKE 19901,&20:POKE 19902,&4E
480 CALL 36000
490 CALL 36176
500 top=20000:h=19999+left%
510 CLS:ZONE 25:GOSUB 3410
520 n$="1234567890123456789012345678901234567890123456
7890123456789012345678901 2
34567890"
530 LOCATE 1,21:PRINT n$;
540 x%=left%:y%=1
550 page%=1
560 PRINT CHR$(7);
570 PRINT #2,"page ";page%
580 b$=INKEY$
590 PRINT CHR$(22);CHR$(1)
600 LOCATE x%,y%:PRINT "_";
610 PRINT CHR$(22);CHR$(0)
620 IF b$="" THEN 580
630 IF b$=CHR$(13) THEN 760 ELSE IF b$=CHR$(127) THEN
800 ELSE IF b$=CHR$(240) T
HEN 870 ELSE IF b$=CHR$(241) THEN 910 ELSE IF b$=CHR$(
242) THEN 950 ELSE IF b$=C
HR$(243) THEN 990 ELSE IF b$=CHR$(224) THEN 1910
640 IF b$=CHR$(9) THEN 1030 ELSE IF b$=CHR$(225) THEN
1110 ELSE IF b$=CHR$(16) T
HEN 1120 ELSE IF b$=CHR$(27) THEN 1140 ELSE IF b$=CHR$
(29) THEN 1450
650 IF insert%=1 THEN 660 ELSE lng%=lng%+1:IF lng%>pos
lng% THEN PRINT CHR$(7);:G
OTO 580
660 IF x%=right%-5 THEN SOUND 1,60,10,2
670 LOCATE x%,y%:PRINT b$;
680 POKE h,ASC(b$)
690 IF y%=bottom% AND x%=right% THEN 580
700 h=h+1
710 x%=x%+1
720 IF x%<=right% THEN 580
730 x%=left%:y%=y%+1
740 h=h+left%-right%+79
750 GOTO 580
760 REM ''''' CR
770 IF y%=bottom% THEN 580 ELSE LOCATE x%,y%:PRINT CHR
$(PEEK(h));
780 h=h+left%-x%+80:x%=left%:y%=y%+1
790 GOTO 580
800 REM ''''' DELETE
810 IF x%=left% AND y%=1 THEN 580
820 LOCATE x%,y%:PRINT CHR$(PEEK(h));
830 x%=x%-1:h=h-1:IF x%=left%-1 THEN GOSUB 860
840 LOCATE x%,y%:PRINT " ";:POKE h,32
850 GOTO 580
860 x%=right%:y%=y%-1:h=h-79+right%-left%:RETURN
870 REM cursor up
880 IF y%=1 THEN 580 ELSE LOCATE x%,y%:PRINT CHR$(PEEK
(h));
890 y%=y%-1:h=h-80:LOCATE x%,y%:PRINT CHR$(PEEK(h));
900 GOTO 580
910 REM cursor down
920 IF y%=bottom% THEN 580 ELSE LOCATE x%,y%:PRINT CHR
$(PEEK(h));
930 y%=y%+1:h=h+80:LOCATE x%,y%:PRINT CHR$(PEEK(h));

940 GOTO 580
950 IF x%=left% AND y%=1 THEN 580 ELSE LOCATE x%,y%:PR
INT CHR$(PEEK(h));
960 IF x%=left% THEN 980
970 x%=x%-1:h=h-1:LOCATE x%,y%:PRINT CHR$(PEEK(h));:GO
TO 580
980 x%=right%:y%=y%-1:h=h-80+right%-left%:LOCATE x%,y%
:PRINT CHR$(PEEK(h));:GOTO
 580
990 REM cursor right
1000 IF x%=right% THEN 1020 ELSE LOCATE x%,y%:PRINT CH
R$(PEEK(h));
1010 x%=x%+1:h=h+1:LOCATE x%,y%:PRINT CHR$(PEEK(h));:G
OTO 580
1020 SOUND 1,80,20,2:IF y%=bottom% THEN 580 ELSE LOCAT
E x%,y%:PRINT CHR$(PEEK(h)
);:x%=left%:y%=y%+1:h=h+left%-right%+80:GOTO 580
1030 IF x%=right THEN 760
1040 FOR i%=x%+1 TO right%
1050 IF xtab%(i%)=1 THEN 1080
1060 NEXT i%
```

(listing continued on next page)

(continued from previous page)

While use of the program's functions is largely self-explanatory, here is a brief description:

Insert: press Ctrl and [. The insertion will be made between the cursor and the character to its left. There are a maximum length of 255 characters or the number of available spaces on the page i.e., if the cursor was at the left of the bottom line the maximum length would be 80. The insertion will be shown at the bottom of the screen and will not be entered until Ctrl and [are pressed for a second time. It can be edited normally.

Delete: press Ctrl and]. Up to 255 characters can be deleted, starting with the character to the left of the cursor. Press Del until the cursor is under the last character to be deleted then Ctrl and]. If you move the cursor too far press the right cursor arrow.

Tab Stops: press Ctrl and Tab to set a tab stop or CLR to clear all tab stops. When Tab is pressed the cursor will advance to the next tab stop if one exists or else the beginning of the next line.

Cursor keys: they move the cursor one space or line in the given direction, within the confines of the margins and screen, without overwriting the text.

Copy key: gives a large range of options for printing a page or pages. If you load a file that is longer than the amount of room you have allocated for it, the machine code will be overwritten and the program will crash. If you are not using an Epson printer consult your printer manual and check lines 360 to 430. ■

(listing continued from previous page)

```
1070 GOTO 760
1080 LOCATE x%,y%:PRINT CHR$(PEEK(h));
1090 h=h+i%-x%:x%=i%
1100 GOTO 580
1110 xtab%(x%)=1:GOTO 580
1120 FOR i%=1 TO 80:xtab%(i%)=0:NEXT i%
1130 GOTO 580
1140 WINDOW SWAP 0,1
1150 insert%=-insert%
1160 IF insert%=1 THEN 1230
1170 CLS:REM start insertion
1180 CALL 36176
1190 lng%=0:posing%=right%-x%+(right%-left%+1)*(20-y%)
1200 bottom%=3:x2%=x%:y2%=y%:x%=left%:y%=1:h2=h:h=3800
0
1210 MOVE 8*left%-9,63:DRAW 8*left%-9,20,1:MOVE 8*righ
t%+1,63:DRAW 8*right%+1,20
,1
1220 GOTO 580
1230 REM end insert
1240 IF x%=right% AND y%=bottom% THEN x%=x%+1:h%=h%+1

1250 lng%=x%-left%+(right%-left%+1)*(y%-1)
1260 CLS #1
1270 IF lng%>0 THEN 1280 ELSE x%=x2%:y%=y2%:h=h2:botto
m=20:GOTO 570
1280 first=top+left%-1
1290 POKE 19903,256*((first/256)-INT(first/256))
1300 POKE 19904,INT(first/256)
1310 skip%=79-right%+left%
1320 POKE 19905,skip%
1330 POKE 19906,80-skip%
1340 POKE 19907,lng%
1350 endseq=20*(right%-left%+1)+34399
1360 POKE 19908,256*((endseq/256)-INT(endseq/256))
1370 POKE 19909,INT(endseq/256)
1380 nmove%=(20-y2%)*(right%-left%+1)+right%-x2%+1-lng
%
1390 POKE 19910,256*((nmove%/256)-INT(nmove%/256))

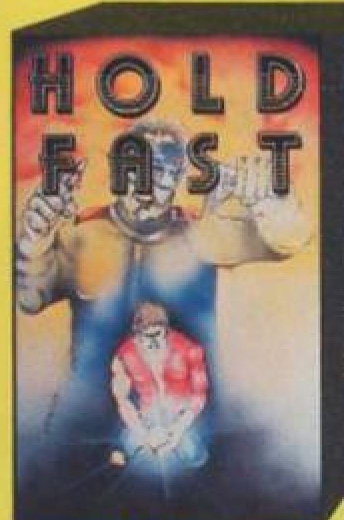
1400 POKE 19911,INT(nmove%/256)
1410 CALL 36057
1420 x%=x2%:y%=y2%:h=h2:bottom%=20
1430 GOSUB 3450
1440 GOTO 570
1450 REM delete block
1460 IF INSERT%=-1 THEN 580 ELSE PRINT #1,"MOVE CURSOR
 BY PRESSING DELETE OR ";C
HR$(243);"UNTIL IT IS BENEATH THE LAST CHARACTER TO BE
 DELETED ","THEN PRESS  CT
RL AND ";CHR$(93)
1470 lng%=0:x2%=x%:y2%=y%
1480 b$=INKEY$
1490 PRINT CHR$(22);CHR$(1)
1500 LOCATE x%,y%:PRINT "_";
1510 PRINT CHR$(22);CHR$(0)
1520 IF b$="" THEN 1480
1530 IF b$=CHR$(127) THEN  1540 ELSE IF b$=CHR$(243) T
HEN  1620 ELSE IF b$=CHR$(
29) THEN 1710 ELSE 1480
1540 IF lng%=255 THEN 1480 ELSE LOCATE x%,y%:PRINT CH
R$(PEEK(h));
1550 IF x%=left% THEN 1580
1560 lng%=lng%+1
1570 x%=x%-1:h=h-1:GOTO 1480
1580 IF y%=1 THEN 1480
1590 lng%=lng%+1
1600 x%=right%:y%=y%-1:h=h-left%+right%-80
1610 GOTO 1480
1620 LOCATE x%,y%:PRINT CHR$(PEEK(h));
1630 IF x%=x2% AND y%=y2% THEN PRINT CHR$(7);:GOTO 148
0
1640 IF x%=right% THEN 1670
1650 x%=x%+1:h=h+1:lng%=lng%-1
1660 GOTO 1480
1670 IF y%=bottom% THEN 1480
1680 x%=left%:y%=y%+1:h=h+80-right%+left%
1690 lng%=lng%-1
1700 GOTO 1480
1710 CLS #1:IF lng%=0 THEN 570
1720 nmove=right%-x2%+1+(right%-left%+1)*(20-y2%)
1730 POKE 19910,256*((nmove/256)-INT(nmove/256))
1740 POKE 19911,INT(nmove/256)
1750 topseq=top+left%-1
1760 POKE 19903,256*((topseq/256)-INT(topseq/256))
1770 POKE 19904,INT(topseq/256)
1780 skip=left%-right%+79
1790 POKE 19905,skip
1800 POKE 19906,80-skip
1810 newcurs=34400+x%-left%+(80-skip)*(y%-1)
1820 POKE 19912,256*((newcurs/256)-INT(newcurs/256))
1830 POKE 19913,INT(newcurs/256)
1840 oldcurs=34400+x2%-left%+(80-skip)*(y2%-1)
1850 POKE 19914,256*((oldcurs/256)-INT(oldcurs/256))

1860 POKE 19915,INT(oldcurs/256)
1870 POKE 19916,lng%+1
1880 CALL 36187
1890 GOSUB 3450
1900 GOTO 570
1910 CLS #1:PRINT #1,"1) print page/pages?","2) printe
r options?","3) scrap/chan
ge page/pages?","4) save/load page/pages?","5) change
margins?","6) quit?","7) s
croll pages?","8) catalog tape?","9) continue?"
1920 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" AND q$<>"4" AND q$<>"
5" AND q$<>"6" AND q$<>"7" AND q$<>"8" AND q$<>"9" THE
N 1920
1930 CLS #1:q%=VAL(q$):ON q% GOTO 1940,2140,2620,2850,
3120,3490,3180,3320,570
1940 CLS #1:PRINT #1,"1) this page to cursor?","2) all
 this page?","3) all nine
pages?","4) pages i to 1?","5) pages 1 to j?","6) page
s j to 9?","7) continue?"
1950 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" AND q$<>"4" AND q$<>"
5" AND q$<>"6" AND q$<>"7" THEN 1950
1960 CLS #1:q%=VAL(q$):ON q% GOSUB 2020,2030,2040,2050
,2080,2110,570
1970 CLS #1:PRINT #1,"PLEASE WAIT"
1980 FOR i=start TO finish
1990 PRINT #8,CHR$(PEEK(i));
2000 NEXT i
2010 CLS #1:GOTO 570
2020 start=top:finish=top+80*y%-1:RETURN
2030 start=top:finish=top+1599:RETURN
2040 start=20000:finish=34399:RETURN
2050 CLS #1:INPUT #1,"enter first and last pages seper
ated by a comma";page1%,pa
ge2%
2060 IF page1%<1 OR page2%>9 OR page1%>page2% THEN 205
0
2070 start=18400+1600*page1%:finish=19999+1600*page2%:
RETURN
2080 CLS #1:INPUT #1,"Enter the last page that you wan
t printed";page2%
2090 IF page2%<1 OR page2%>9 THEN 2080
2100 start=20000:finish=19999+1600*page2%:RETURN
2110 CLS #1:INPUT #1,"Enter the first page to be print
ed";page1%
2120 IF page1%<1 OR page1%>9 THEN 2110
2130 start=18400+1600*page1%:finish=34399:RETURN
2140 REM printer options
2150 CLS #1:PRINT #1,"1) form feed?","2) set/reset ita
lics?","3) change line sep
eration?","4) advance i lines?","5) type options?","6)
 main options?","7) contin
ue?"
2160 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" AND q$<>"4" AND q$<>"
5" AND Q$<>"6" AND q$<>"7" THEN 2160
2170 CLS #1:q%=VAL(q$):ON q% GOTO 2190,2210,2250,2300,
2340,1910,570
2180 REM ff
2190 PRINT #8,CHR$(12);:GOTO 2150
2200 REM italics
2210 IF set%=1 THEN PRINT #8,CHR$(27);"4"; ELSE PRINT
#8,CHR$(27);"5";
2220 IF page1%<1 OR page2%>9 OR page1%>page2% THEN 221
0
2230 set%=-set%:FOR delay%=0 TO 1000:NEXT:PRINT #8,CHR
$(13);:GOTO 2150
2240 REM line seperation
2250 CLS #1:PRINT #1,"Line seperations is currently se
t at ";space%";/72 of an i
nch."
2260 INPUT #1,"What value n/72 do wish to reset it to"
;space%
2270 IF space%<0 OR space%>255 THEN 2260
2280 PRINT #8,CHR$(27);"A";CHR$(space%);:PRINT #8,CHR$
(13);:GOTO 2150
2290 REM advance i lines
2300 CLS #1:INPUT #1,"How many lines do you want to ad
vance the paper";i%
2310 IF i%<1 THEN 2300
2320 FOR n%=1 TO i%:PRINT #8,CHR$(10);:NEXT n%:GOTO 21
50
2330 REM screen options
2340 CLS #1:PRINT #1,"1) set/reset emphasis?","2) set/
reset double strike?","3)
change type size?","4) printer options?","5) main opti
ons?","6) continue?"
2350 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" AND q$<>"4" AND q$<>"
5" AND q$<>"6" THEN 2350
2360 CLS #1:q%=VAL(q$):ON q% GOTO 2380,2430,2480,2150,
1910,570
2370 REM set/reset emphasis
2380 emphasis%=-emphasis%
2390 IF emphasis%=1 THEN PRINT #8,CHR$(27);"E"; ELSE P
RINT #8,CHR$(27);"F";
2400 IF emphasis%=1 THEN PRINT #1,"Print is now emphas
ized." ELSE PRINT #1,"Prin
t is now normal."
2410 FOR delay=0 TO 1000:NEXT:PRINT #8,CHR$(13);:GOTO
2340
2420 REM ds
2430 strike%=-strike%
2440 IF strike%=1 THEN PRINT #8,CHR$(27);"G"; ELSE PRI
NT #8,CHR$(27);"H";
2450 IF strike%=1 THEN PRINT #1,"Printing is now in do
uble strike mode." ELSE PR
INT #1,"Printing is now in normal mode."
2460 FOR delay=1 TO 1000:NEXT:PRINT #8,CHR$(13);:GOTO
2340
2470 REM change type size
2480 CLS #1:PRINT #1,"1) pica?","2) elite?","3) enlarg
ed pica?","4) enlarged elit
e?","5) printer options?","6) main options?"
2490 PRINT#1,"WARNING: CHARACTER SIZE MAY NOT BE SUITE
D TO YOUR PAPER WIDTH.  MA
RGINS SHOULD ALSO BE CHANGED SO THAT LEFT AND RIGHT E
DGES OF DIFFERENT TYPE SIZ
ES COINCIDE."
2500 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" AND q$<>"4" AND q$<>"
5" AND Q$<>"6" THEN 2500
2510 CLS #1:q%=VAL(q$):ON q% GOTO 2520,2520,2520,2520,
2150,1910
2520 IF type%=3 OR type%=4 THEN PRINT #8,CHR$(27);"W";
CHR$(0);
2530 type%=q%:ON q% GOTO 2550,2570,2590,2610
2540 REM pica
2550 PRINT #8,CHR$(27);"P";:PRINT #8,CHR$(13);:GOTO 21
50
2560 REM elite
2570 PRINT #8,CHR$(27);"M";:PRINT #8,CHR$(13);:GOTO 21
50
2580 REM enlarged pica
2590 PRINT #8,CHR$(27);"P";:PRINT #8,CHR$(27);"W";CHR$
(1);:PRINT #8,CHR$(13);:GO
TO 2150
2600 REM enlarged elite
2610 PRINT #8,CHR$(27);"M";:PRINT #8,CHR$(27);"W";CHR$
(1);:PRINT #8,CHR$(13);:GO
TO 2150
2620 CLS #1:PRINT #1,"1) scrap this page?","2) scrap a
ll pages?","3) next page?"
,"4) previous page?","5) page 1?","6) main options?","
7) continue?"
2630 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" AND q$<>"4" AND q$<>"
5" AND Q$<>"6" AND q$<>"7" THEN 2630
2640 CLS #1:q%=VAL(q$):ON q% GOTO 2650,2700,2720,2760,
2800,1910,570
2650 POKE 19901,256*((top/256)-INT(top/256)):POKE 1990
2,INT(top/256)
2660 CALL 36018:CLS:GOSUB 3410
2670 x%=left%:y%=1:h=top+left%-1
2680 LOCATE 1,21:PRINT n$;
2690 GOTO 570
2700 PRINT #1,"ARE YOU SURE?  (Y or N)"
2710 q$=INKEY$:IF q$="Y" OR q$="y" THEN 460 ELSE IF q$
="N" OR q$="n" THEN 2620 E
LSE GOTO 2710
2720 IF page%=9 THEN page%=0
2730 page%=page%+1:top=18400+1600*page%:h=top+left%-1:
x%=left%:y%=1
2740 CLS #1:GOSUB 3430
2750 GOTO 570
2760 IF page%=1 THEN page%=10
2770 page%=page%-1:top=18400+1600*page%:h=top+left%-1:
x%=left%:y%=1
2780 CLS #1:GOSUB 3430
2790 GOTO 570
2800 CLS #1:INPUT #1,"which page do you want to change
 to";page%
2810 IF page%<1 OR page%>9 THEN 2800
2820 top=18400+1600*page%:h=top+left%-1:x%=left%:y%=1
2830 CLS #1:GOSUB 3430
2840 GOTO 570
2850 CLS #1:PRINT #1,"1) save?","2) load?","3) continu
e?"
2860 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" THEN 2860
2870 CLS #1:opt%=VAL(q$):IF opt%=3 THEN 570
2880 CLS #1:PRINT #1,"1) this page?","2) all nine page
s?","3) pages i to j"
2890 IF opt%=2 THEN PRINT #1,"WARNING:CONTENTS OF PRES
ENT PAGE/PAGES WILL BE OVE
RWRITTEN!";PRINT #1,"WARNING: THE LENGTH OF THE FILE M
UST BE COMPATIBLE WITH YOU
R CHOICE!  IF THE    FILE EXCEEDS THE AVAILABLE SPACE
THE PROGRAM WILL CRASH!"
2900 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND Q$
<>"3" THEN 2900
2910 q%=VAL(q$):ON q% GOSUB 3050,3060,3080
2920 CLS #1:INPUT #1,"what is the filename";n$
2930 IF opt%=2 THEN 2990
2940 REM save a page
2950 WINDOW SWAP 0,1:CLS
2960 SAVE n$,b,start,length
2970 CLS
2980 WINDOW SWAP 0,1:GOTO 570
2990 REM load a page
3000 WINDOW SWAP 0,1:CLS
3010 LOAD n$,start
3020 CLS:WINDOW SWAP 0,1
3030 x%=left%:y%=1:h=top+left%-1:GOSUB 3430
3040 GOTO 570
3050 start=top:length=1600:RETURN
3060 start=20000:length=14400:IF opt%=2 THEN top=20000
3070 RETURN
3080 CLS #1:INPUT #1,"Enter the first and last pages s
eperated by a comma";first
%,last%
3090 IF first%<1 OR last%>9 OR first%>last% THEN 3080

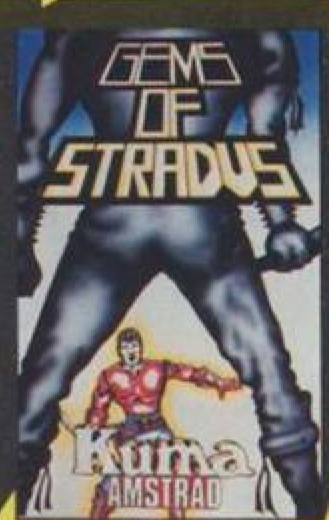
3100 start=18400+1600*first%:length=(last%-first%+1)*1
600:IF opt%=2 THEN top=sta
rt:page%=first%
3110 RETURN
3120 LOCATE x%,y%:PRINT CHR$(PEEK(h));
3130 GOSUB 3390
3140 x%=left%:y%=1
3150 h=top+left%-1
3160 GOSUB 3430
3170 GOTO 570
3180 REM scroll pages
3190 CLS #1:PRINT #1,"1) from present page?","2) from
page 1?","3) continue?"
3200 q$=INKEY$:IF q$="" OR q$<>"1" AND q$<>"2" AND q$<
>"3" THEN 3200
3210 CLS #1:q%=VAL(q$):ON q% GOTO 3220,3290,570
3220 CLS #1:PRINT #1;PRINT #1,"PRESS SPACE BAR TO CONT
INUE SCROLLING, ANY OTHER
KEY TO STOP ON DISPLAYED PAGE."
3230 PRINT #2,"page ";page%:GOSUB 3430
3240 Q$=INKEY$:IF q$="" THEN 3240
3250 IF q$=" " THEN 3260 ELSE CLS #1:GOTO 3300
3260 page%=page%+1:IF page%=10 THEN page%=1
3270 top=18400+1600*page%
3280 GOTO 3230
3290 top=20000:page%=1:GOTO 3220
3300 h=top+left%-1:x%=left%:y%=1:GOTO 570
3310 xtab%(x)=1:GOTO 580
3320 WINDOW SWAP 0,1:CLS
3330 PRINT "press ESC to stop cataloging."
3340 ON BREAK GOSUB 3500
3350 CAT
3360 CLS:WINDOW SWAP 0,1:GOTO 570
3370 left%=8:right%=72
3380 RETURN
3390 PRINT CHR$(7);:CLS #1:INPUT #1,"enter left then r
ight margins seperated by
a comma";left%,right%:CLS #1
3400 IF left%<1 OR right%>80 OR left%>=right% THEN 339
0 ELSE RETURN
3410 MOVE 8*left%-9,80:DRAW 8*left%-9,400,1:MOVE 8*rig
ht%+1,80:DRAW 8*right%+1,4
00,1
3420 RETURN
3430 POKE 19901,256*((top/256)-INT(top/256))
3440 POKE 19902,INT(top/256)
3450 LOCATE 1,1
3460 CALL 36037
3470 GOSUB 3410
3480 RETURN
3490 MODE 2:END
3500 ON BREAK STOP
3510 RETURN
3520 CAT
```

the only choice

Kuma AMSTRAD CPC464 software



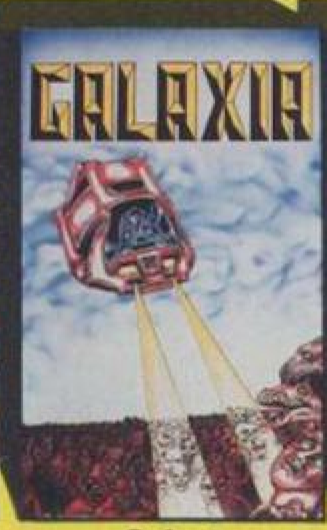
Holdfast



Gems of Stradus



Star Avengers



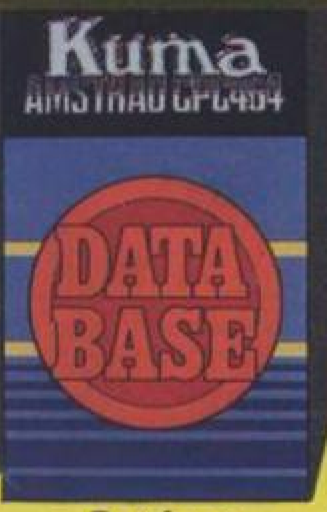
Galaxia



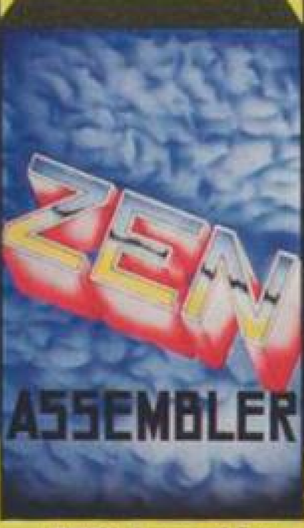
Music Composer



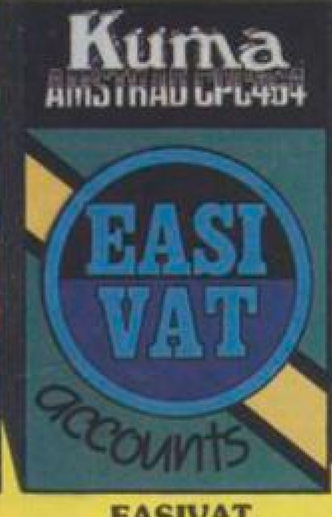
Logo



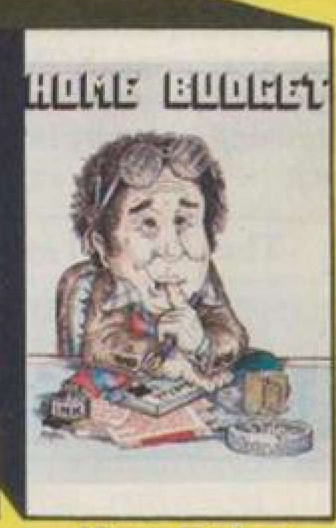
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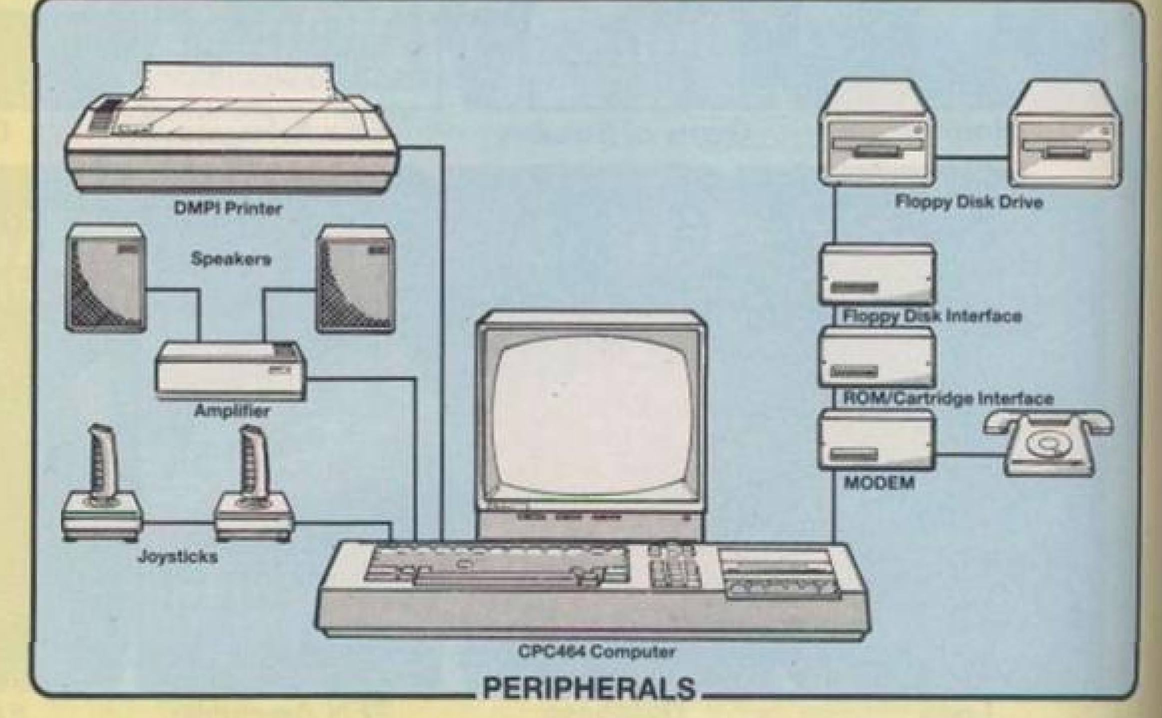
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Figure 3. List of DMACTL and GRACTL options.

GRACTL LOCATION 53277

Poke No.	Action
1	enable missiles
2	enable players
3	enable players + missiles

E.G. Poke 53277, 2 enables players.

DMACTL LOCATION 559

Add to the contents of DMACTL	Action
+4	enable missiles
+8	enable players
+12	enable players + missiles
+16	enable single resolution
+0 (default)	enable double resolution

E.G. Poke 559, Peek (559) + 12 + 16 enables players + missiles in single resolution.

The default for DMACTL, from power on or from system reset is 34.

Figure 4. Other player/missile registers.

Name(s)	Location(s)	Purpose
HPOSP0 (−3)	53248-51	Player horizontal Position Registers
HPOSM0 (−3)	53252-55	Missile horizontal Position registers
Size P0 (−3)	53256-59	Player size Registers
Size M	53260	Missile size Register
COLPM0 (−3)	704-707	Player/missile Colour registers

Figure 5. Priority Register.

Prior location 623

Priorities in this order

PF0, PF1, P0-3, PF2-3, background — 8

PF0-3, PO-3, background — 4

P0-1, PF0-3, P2-3, background — 2

P0-3, PF0-3, background — 1

E.G. Poke 623,2

PF = Playfield i.e. colours 0-3

P = Player 0-3

Figure 6. Collision Registers.

Location	Collision detection
53248	M0 to playfield
53249	M1 to playfield
53250	M2 to playfield
53251	M3 to playfield
53252	P0 to playfield
53253	P1 to playfield
53254	P2 to playfield
53255	P3 to playfield
53256	M0 to player
53257	M1 to player
53258	M2 to player
53259	M3 to player
53260	P0 to player
53261	P1 to player
53262	P2 to player
53263	P3 to player

53278 — HITCLR — Poke with any to clear collision registers.

Figure 7.

```
PMSTART = START + (512+(512*RES))
+ PLAYER (128+(128*RES))
MSB = INT (PMSTART/256)
LSB = PMSTRT - (MSB*256)
FOR T = TO 6
READ A,B
POKEA,MSB:POKEB,LSB:NEXT T
DATA 1562, 1561, 1569, 1568, 1580, 1579,
1605, 1604, 1612, 1611, 1623, 1622
RETURN
```

Patrick Nevison helps your screen come alive with Atari animation

ANIMATION WITH most personal computers is a time consuming and tedious process. To make a finely detailed image move across the screen involves the following process:

- ☐ Look at the background ahead of the image and temporarily store the contents.
- ☐ Erase the old image — draw in the background colour.
- ☐ Draw the new image.
- ☐ Restore the background at the previous image position.
- ☐ Repeat from step 1.

An example of this type of animation is given in listing 1. There has to be an easier and faster method. Machine code is one answer but is not easy to write or debug and one error can be catastrophic. Atari owners, among others, have a solution in hardware. Sprite, or as Atari call them player/missile graphics. A player is a graphic object which is shape and colour definable, and when moved over any background — playfield — image does not erase or alter it in any way. Type in listing 2 and see the same animation but using player graphics. In fact, there is a delay loop in listing 2 to make the two comparable.

So, what do we have in Atari computers — four user-definable objects all of independent colour, independent shape, moving rapidly anywhere in any graphics mode without disturbing anything else. Sounds too good to be true. In fact, there are a few complications. Atari Basic is now showing its age against newer structured and more capable Basics.

Specifically, as regards P/M graphics, there are no commands to deal with this type of animation in Atari Basic. Thus, all dealings with P/M are done with the immortally incomprehensible Peek and Poke. Never fear, although the details are tedious and time consuming — though well worth it for the displays they make — the principles are quite straightforward.

As Atari Basic does not recognise P/M graphics, we must cordon off an area of memory to hold all of the data, so that Basic does not corrupt the information. The high end of memory is ideal for this and location 106 contains the number of "pages" — 256 bytes to a page — free at any one time. In changing the contents of location 106 we fool the computer into thinking it has less memory than is actually there, thus providing a safe place to store all of the P/M data.

Players are all eight bits — dots, pixels, whatever — wide, but can come in two heights. They are up to 128 bits high — double resolution — or up to 256 bits high — single resolution. There are swings and roundabouts in choosing which type you will

ATARI A

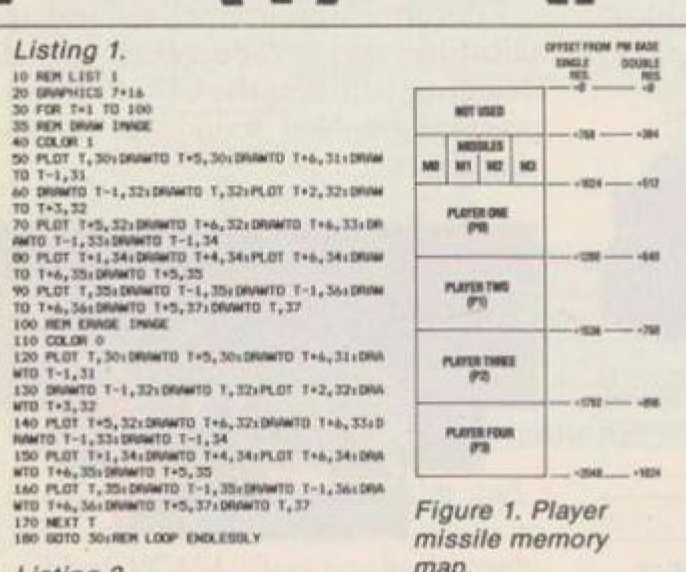


Figure 1. Player missile memory map.

Listing 1.

```
10 REM LIST 1
20 GRAPHICS 7+16
30 FOR T=1 TO 100
35 REM DRAW IMAGE
40 COLOR 1
50 PLOT T,30:DRAWTO T+5,30:DRAWTO T+6,31:DRAW
TO T-1,31
60 DRAWTO T-1,32:DRAWTO T,32:PLOT T+2,32:DRAW
TO T+3,32
70 PLOT T+5,32:DRAWTO T+6,32:DRAWTO T+6,33:DR
AWTO T-1,33:DRAWTO T-1,34
80 PLOT T+1,34:DRAWTO T+4,34:PLOT T+6,34:DRAW
TO T+6,35:DRAWTO T+5,35
90 PLOT T,35:DRAWTO T-1,35:DRAWTO T-1,36:DRAW
TO T+6,36:DRAWTO T+5,37:DRAWTO T,37
100 REM ERASE IMAGE
110 COLOR 0
120 PLOT T,30:DRAWTO T+5,30:DRAWTO T+6,31:DRA
WTO T-1,31
130 DRAWTO T-1,32:DRAWTO T,32:PLOT T+2,32:DRA
WTO T+3,32
140 PLOT T+5,32:DRAWTO T+6,32:DRAWTO T+6,33:D
RAWTO T-1,33:DRAWTO T-1,34
150 PLOT T+1,34:DRAWTO T+4,34:PLOT T+6,34:DRA
WTO T+6,35:DRAWTO T+5,35
160 PLOT T,35:DRAWTO T-1,35:DRAWTO T-1,36:DRA
WTO T+6,36:DRAWTO T+5,37:DRAWTO T,37
170 NEXT T
180 GOTO 30:REM LOOP ENDLESSLY
```

Listing 2.

```
10 REM LIST 2
20 A=PEEK(106)-4:POKE 106,A:GRAPHICS 2+16:REM
 SET ASIDE P/M AREA
30 PMSTART=A*256
40 REM CLEAR PLAYER 0 AREA
50 START=PMSTART+512
60 FOR T=START TO START+128:POKE T,0:NEXT T
70 REM DEFINE PLAYER
80 FOR T=START+30 TO START+30+7
90 READ N
100 POKE T,N
110 NEXT T
120 DATA 126,255,219,255,189,195,255,126
130 REM SET PMBASE
140 POKE 54279,A
150 REM SET DMACTL
160 POKE 559,42
170 REM SET GRACTL
180 POKE 53277,2
190 REM SET PLAYER 0 COLOUR
200 POKE 704,14
210 REM MOVE PLAYER 0
220 FOR T=70 TO 180
230 POKE 53248,T
240 REM DELAY--SLOW IT DOWN
250 FOR D=1 TO 50:NEXT D
260 NEXT T
270 GOTO 200
```

Listing 3.

```
0 REM LIST 3
9 REM SET ASIDE 1K FOR PM TABLE
10 PAGES=PEEK(106)-4:POKE 106,PAGES:GRAPHICS
3
11 POKE 752,1:REM TURN OFF CURSOR
19 REM CALC START ADDR.FOR PM TABLE
20 PMTABLE=PAGES*256
29 REM START ADDR. PLAYER 0
30 START=PMTABLE+512
39 REM CLEAR PLAYER 0 AREA
40 FOR T=START TO START+128:POKE T,0:NEXT T
49 REM VERT POSN. PLAYER 0
50 VERT=50
59 REM READ PLAYER DEFN.TO TABLE
60 FOR T=START+VERT TO START+VERT+7:READ A:PO
KE T,A:NEXT T
69 REM PLAYER IMAGE DATA
70 DATA 126,255,219,255,189,195,255,126
89 REM SET UP BACKGROUND
90 COLOR 1:PLOT 32,2:DRAWTO 32,20
100 COLOR 2:PLOT 22,2:DRAWTO 22,20
110 COLOR 3:PLOT 12,2:DRAWTO 12,20
119 REM SET PMBASE
120 POKE 54279,PAGES
129 REM SET DMACTL
130 POKE 559,46
139 REM SET GRACTL
140 POKE 53277,2
149 REM PLAYER 0 COLOUR
150 POKE 704,14
159 REM SET HORIZONTAL POSITION
160 HPOSP0=53248
169 REM SET PRIORITY
170 POKE 623,4
179 REM MOVE PLAYER-CHECK COLLISIONS
180 FOR T=190 TO 40 STEP -1
190 POKE HPOSP0,T
200 ? "COLLISION  ";PEEK(53252)
209 REM RESET USING HITCLR
210 POKE 53278,1
220 NEXT T
229 REM LOOP ENDLESSLY
230 GOTO 180
```

Listing 4.

```
0 REM LISTING 4  PM VERT MOVE ROUTINE
10 GOSUB 25150:REM INSTALL VERT MOVE ROUTINE
20 POKE 106,60:REM RESERVE RAM FOR TABLE
30 ? "}":POKE 752,1:POKE 710,6:POKE 709,0:REM
 CLEAR SCREEN
```

(continued on page 131)

use. Double resolution uses less memory — 1K in total for all four players — and is faster to animate, but its resolution or image quality is poorer.

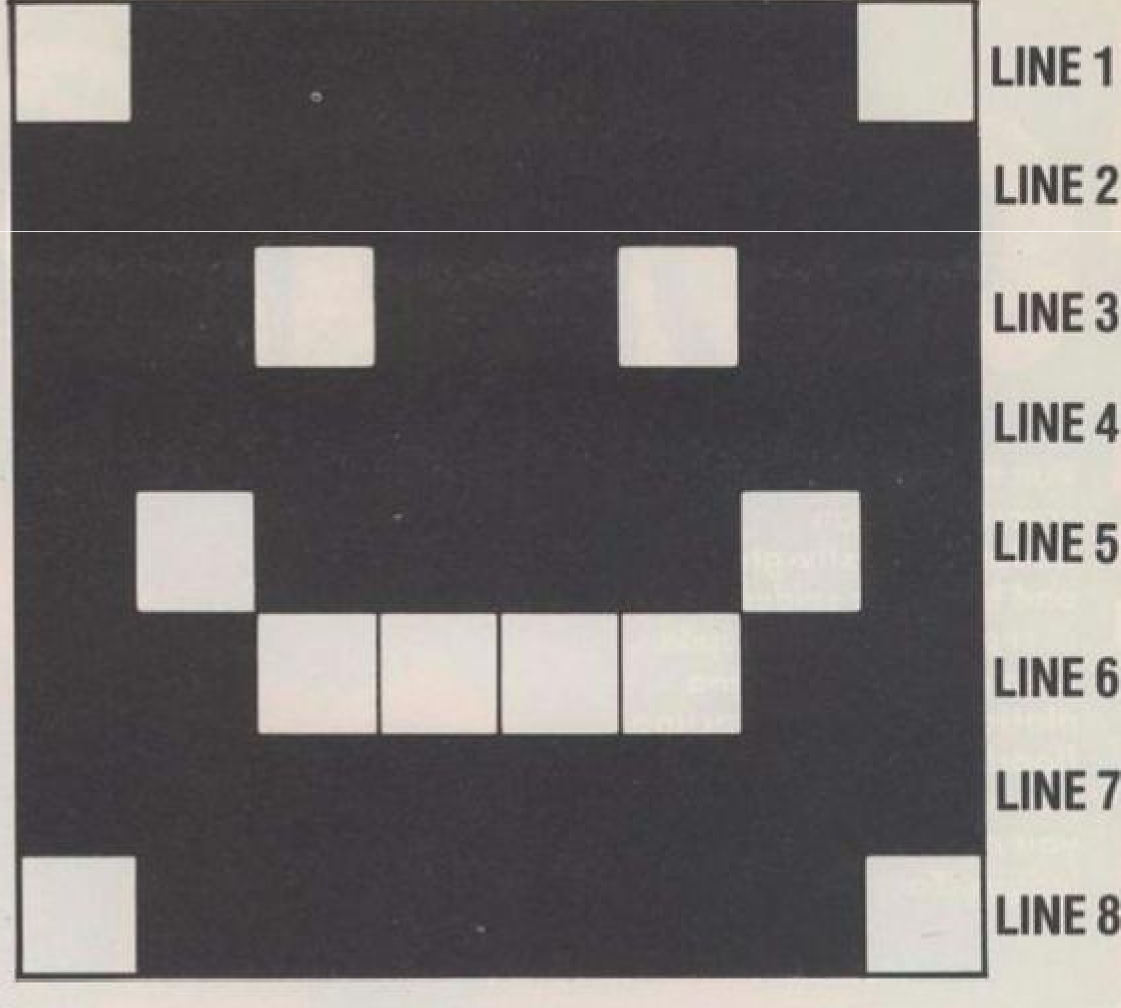
The single resolution players use 2K of memory, are slower to move out have a better quality image. For the sake of argument, I will discuss double resolution and point out where details differ between the two types. So, we need to set aside 1K of memory for the player missile table. This 1K is equal to four pages of memory — 4 × 256 = 1024 = 1K — hence:

```
A = PEEK(106)-4 : POKE 106,A ( - 8 for single
                 resolution)
```

will "hide" our P/M table from Basic. We then must tell the computer, actually the Antic video chip, exactly where in memory our table is located. Location 54279 is called the Player Missile Base Address Register — PMBase. Using our previously defined variable A, give the instruction,

```
POKE 54279,A
```

This is in fact just the start address of the table, and figure 1 shows how each of the players and missiles are located in the table. You will notice that the Player areas do not start until half way down the table. The first 384 bytes — 768 for single resolution — are unused, but can make a valuable place for storing machine code routines or tables of data as Basic leaves all areas above PMBase untouched.



ANIMATION

Locations 384-512 in the table are the Missile definitions. The next step after making your table secure is to clear the areas to be used. On many computers, when you turn them on much of the memory is filled with random numbers.

This will affect the Player image and so they must be cleared. You do not need to clear all of the table, just the parts you are going to use. For example, if you are only going to use the first 2 players, the instructions would read something like,

```
FOR T = A*256 + 512 TO
A*256 + 768
POKE T,0
NEXT T
```

The definition of the player's image is perhaps the most difficult part to grasp straight away, but is crucial to fully exploiting player/missile animation. Examine figure 2 which gives a simple Player definition. All players are eight bits wide and I have made this one eight bits high. The definition runs from top to bottom: Each horizontal line — eight bits wide always — has its "on" bits coloured.

These bits are then added up from left to right according to the Binary number system. So each horizontal "slice" of the definition ends up having a number to define it. Each of these bytes is then Poked into the relevant section in the P/M table. These "bit maps" have to be positioned in each section according to the vertical position on the TV.

If you put the definition at the start of the section of the table, the image will appear at the very top of the TV screen. Place your definition in the centre of the table and it will appear in the centre of the screen, and so on.

As an example. If the beginning of Player 0 section of the table in memory is given by the variable START, and we want to place the image 10 dots from the top of the screen, we would have

```
FOR T = START + 10 TO START + 10 + 7
READ N
POKE T,N
NEXT N
DATA 126,255,219,255,189,195,255,126
```

The players can be placed, or moved about anywhere within their own section, and this is how vertical motion is achieved, but it is up to the programmer to make sure that they do not move into another player's area. Horizontal motion is very much easier. Each player has a Horizontal Position Register — HPOSPO to HPOSP3. To move Player 0 from left to right, simply increase the number in location 53248.53249-51 to cover the other players. The colours of the players and missiles are read from 704-707. The colours follow the standard Atari colour numbers:

```
POKE 704,COLOUR*16 + LUMINANCE
```

where Colour = 0 to 15 and Luminance = 0 to 15.

Each player also has a Size register (53256-59). 0 = Normal width, 1 = Double width and 3 = Quadruple width. Experiment with this to see its effect.

The missiles mentioned before behave in most respects like miniature players. They are only two bits wide. They have their own horizontal position registers, but take the colour of their associated player, and have only one size register, making all four missiles the same width.

When using PM graphics, one drawback is that the Antic video chip "steals" time from the main 6502 chip to move and display them. This means that when P/M are in use all other functions will slow down slightly. Consequently, Atari has made the use of P/M optional. Two auxiliary registers are used to switch P/M graphics on and off. Graphics Control Register — GRACTLY — and Direct Memory Access Control Register — DMACTL. These must be enabled before P/M can be used. A list of the various Pokes and their effect are given in figure 3. A summary of the other P/M Registers is given in figure 4.

(continued on page 131)



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(continued from page 129)

One of the most useful qualities that P/M graphics offers to games programmers is that of automatic "collision detection". Collision is the name given when any player or missile occupies the same position on the screen as any other Player, Missile or any of the screen colours — playfield. When a collision occurs the computer automatically sets the appropriate register and all the programmer has to do is Peek that register to see if the collision has occurred.

Listing 3 shows this collision detection at work by moving player 0 across 3 vertical lines drawn in different colours. The text window shows the state of the collision detection register. Also shown in this program is another very powerful P/M technique known as Priority.

Priority means that when a Player and another object collide — either another player, missile or playfield colour — it will appeal to pass either behind of or in front of the other object. Used properly this can make a very attractive tool. A list of some of the priority settings is given in figure 5. Figure 6 gives all of the Collision Detection Registers. The register you are scanning may give one of several values, depending on which object your player has collided with.

For Example, location 53252 — PO to playfield — is the register displayed in the text window in listing 3, and depending which coloured bar the player is in contact with the register will contain a different value. A complete list of all possible collisions of players, missiles and playfield colours is too long to publish here, but experiment yourself and you will find that perhaps you only need to use a couple of registers depending on what program you are using them in. When a collision has occured all collision registers have to be reset by Poking any number into HITCLR location 53278.

Just a word on the difference between TV sets. All TVs are subject to a thing called Overscan. This means that all TV pictures are not centred perfectly — particularly among the cheaper makes — and is the reason why all computers designed to be used with TVs and not exclusively monitors have a border around the screen. Player Missile graphics are not restricted to the main screen area and can go beyond the border.

This means that of all the combinations of the horizontal registers only the positions 40-190 will be visible on the screen. Take care that if you are writing software that will be used by other people on differing screens, not to use the areas of screen beyond the normal borders for playfield graphics or text, for if their TV is different from yours, they may miss the images off to one side of their screen. Happily, a good use can be put to Overscanning.

If you execute any Graphics instructions after setting up your P/M graphics you will have to reset PMBase, GRACTL and DMACTL. This only takes a very short time, but can cause an annoying "flicker" from any player or Missile on the screen. This is solved by setting the Horizontal positions of the players and missiles so that they are off the visible screen area while you reset Graphics modes and the auxiliary registers.

Only one problem remains to speed P/M animation from basic vertical movement. To animate vertically we need to move the whole bit map of the player or missile higher — down the screen — or lower — up the screen — within its relevant section in the Player Missile table.

A machine-code subroutine is the only way of achieving this speed. Such a routine is listing 4. This can be integrated into your own programs, and movement is achieved by passing variables through a USR command.

Finally, listing 5 gives a player editor program. This allows you to design a player up to 20 bits high using a joystick in port 1. Colour, resolution — single or double — and width are all changeable from the function keys, allowing you to see exactly how the player will look on the screen. Data from the image is given to include in your own program. Instructions are in the program.

Listing 4 is only equipped to deal with one player at a time. Embedded in the routine is an address which assumes that the player section of the table starts at 15872. This is equivalent to the highest place in memory that a 16K machine can place a double resolution player 0. To accommodate a different player and/or a different amount of RAM, 12 numbers have to be changed.

Add the short Basic routine below to your program and call this routine whenever you wish to change the player that you are moving vertically. Three variables need to be passed on to the routine. Start being the beginning of the entire P/M table in memory. Player being the player number you wish to use — 0, 1, 2 or 3. Res is 0 for double resolution and 1 for single. The routine can be placed anywhere in your program and called by a Gosub command, and ending the routine with a Return command — see figure 7.

There are two places to call the machine-code routine from.

To move down the screen (up in memory) call

A = USR(1536,LENGTH,HEIGHT,SPEED)

To move up the screen (down in memory) call

A = USR(1588, LENGTH, HEIGHT, SPEED)

The three variables Length, Height and Speed must be updated by the user's Basic program.

Length is the number of bytes in the player definition.

Height is the number of bytes offset from the start of the players section in the table, to the actual start of the player.

Speed is the number of points or spaces to move the player up or down in any one call. Length and Speed will probably remain constant throughout a program, though they need not. But every time a vertical move is made, the Height variable must be updated.

A = USR (1536, LENGTH, HEIGHT, SPEED): HEIGHT = HEIGHT + SPEED
or A = USR (1588, LENGTH, HEIGHT, SPEED): HEIGHT = HEIGHT − SPEED

(listing 4 continued from page 129)

```
35 POSITION 0,10:? "INSERT JOYSTICK INTO PORT
 1":? "-UP PLAYER":? "-DOWN PLAYER"
40 START=60*256:PO=START+512
50 FOR T=PO TO PO+128:POKE T,0:NEXT T:REM CLE
AR PLAYER 0 AREA
60 HEIGHT=70:SPEED=3:LENGTH=8
65 RESTORE 90
70 FOR T=PO+HEIGHT TO PO+HEIGHT+7
80 READ A:POKE T,A:NEXT T:REM DEFINE PLAYER 0
90 DATA 126,255,219,255,189,195,255,126
100 POKE 54279,START/256
110 POKE 53277,2
120 POKE 559,42
130 POKE 53248,100
140 POKE 704,14
150 A=STICK(0):IF A=15 THEN 150
160 IF A=13 THEN A=USR(1536,LENGTH,HEIGHT,SPE
ED):HEIGHT=HEIGHT+SPEED
170 IF A=14 THEN A=USR(1588,LENGTH,HEIGHT,SPE
ED):HEIGHT=HEIGHT-SPEED
180 POSITION 0,0:? "HEIGHT";HEIGHT;"  ":GOTO
150
25150 REM DATA FOR P/M VERT MOVE ROUTINE
25151 REM EVERY OCCURENCE OF 0,62 IS THE ADDR
ESS OF PLAYER 0 SECTION OF THE TABLE
25152 REM SINCE  62*256+0=15872
25153 RESTORE 25160
25155 FOR T=1536 TO 1630:READ A:POKE T,A:NEXT
 T
25160 DATA 104,104,104,133,203,104,104,133,20
4,104,104,133,205,165,204,24,101,203,133,204,
198,204
25161 DATA 164,204,185
25162 DATA 0,62
25163 DATA 133,206,169,0,153
25164 DATA 0,62
25165 DATA 165,206,166,205,200,202,208,252,15
3
25166 DATA 0,62
25167 DATA 198,204,198,203,208,227,96
25168 DATA 104,104,104,133,203,104,104,133,20
4,104,104,133,205,164,204,185
25169 DATA 0,62
25170 DATA 133,206,169,0,153
25171 DATA 0,62
25172 DATA 165,206,166,205,136,202,208,252,15
3
25173 DATA 0,62
25174 DATA 230,204,198,203,208,227,96
25175 RETURN
```

Listing 5.

```
10 REM ****************************
20 REM ** ATARI SPRITE EDITOR **
30 REM ** (C) 1983 PAT NEVISON**
40 REM ****************************
50 GOSUB 10000:REM SET UP VARIABLES
60 GOSUB 11000:REM DRAW SCREEN+BITMAP
70 POKE 53248,10
100 REM MAIN EDITOR LOOP
105 POSITION COL,0:? "":POSITION 24,ROW:? ""
110 ST=STICK(0):SB=STRIG(0)
120 IF ST=15 AND SB=1 THEN 200:REM GOTO SCAN
CONSOLE KEYS
130 GOTO 300:REM JOYSTICK EDITING
200 CON=PEEK(53279):IF CON=7 OR CON=6 THEN 10
0:REM NO CONSOLE KEY PRESSED
205 POSITION 2,22:? "JUST A SECOND..":GOSUB 1
3000:REM UPDATE PMDAT$
210 IF CON=3 THEN POKE 53248,180:GOSUB 20000:
REM OPTION PRESSED GOTO VIEW MENU
220 IF CON<>5 THEN 100:REM NOT SELECT
230 ? "}":? "     PLAYER DATA   BYTE NUMBER"
240 FOR T=1 TO 20:? "              ";ASC(PMDAT$(T
,T)),"    ";T
250 NEXT T
260 ? :? "  PRESS SPACE TO RETURN TO EDITOR";
270 POKE 764,255
280 IF PEEK(764)=255 THEN 280
290 GOSUB 11000:GOTO 100
300 REM JOYSTICK EDITING
310 IF ST=5 OR ST=6 OR ST=9 OR ST=10 THEN 100
315 IF SB=0 THEN 400
320 POSITION COL,0:? " ":POSITION 24,ROW:? "
"
330 IF ST=14 THEN ROW=ROW-1+(ROW<3)
340 IF ST=13 THEN ROW=ROW+1-(ROW>20)
350 IF ST=11 THEN COL=COL-1+(COL<28)
360 IF ST=7 THEN COL=COL+1-(COL>33)
370 POSITION COL,0:? "":POSITION 24,ROW:? ""
380 GOTO 100
400 REM FILL CURSOR
410 LOCATE COL,ROW,DOT:IF DOT=160 THEN POSITI
ON COL,ROW:? " ":GOSUB 16000:GOTO 100:REM ERA
SE DOT FROM BIT MAP
420 LOCATE COL,ROW,DOT:IF DOT=32 THEN POSITIO
N COL,ROW:? " ":GOSUB 17000:GOTO 100:REM FILL
 DOT ON BIT MAP
10000 REM SET UP VARIABLES
10010 PMBASE=64:POKE 106,PMBASE:GRAPHICS 0:PO
KE 710,0:POKE 752,1
10015 POSITION 12,12:? "INITIALISING..."
10020 DIM PMDAT$(25):COL=27:ROW=2
10030 DIM PM$(180):PM$=" ":PM$(159)=" ":PM$(2
)=PM$
10040 GOSUB 13000:REM CHANGE PM$ TO PMDAT$
10050 HPO=180:COLPO=54:RES=1
10060 CL=3:LM=10:SIZE=0
10070 VALDMACTL=PEEK(559)-8+(RES*16-16)
10080 GOSUB 15000:REM SET UP PM DISPLAY
10200 RETURN
11000 REM CLEAR SCREEN SET UP BIT MAP
11005 ? "}":POKE 710,0
11010 POKE 82,25:POKE 83,26:POSITION 25,2:? "
0102030405060708091011121314151617181920";:PO
KE 82,2:POKE 83,39
11020 POSITION 2,1:? :? "SPRITE EDITOR":? :?
"JOYSTICK CONTROLS"
11030 ? :? "-UP CURSOR":? "-DOWN CURSOR":? "-
LEFT CURSOR":? "-RIGHT CURSOR"
11035 ? :? "-FILL/ERASE CURSOR"
11040 ? :? :? :? "OPTION-VIEW MENU":? :? "SEL
ECT-LIST DATA"
11050 POSITION 27,1:? "76543210"
11060 POKE 82,27:POKE 83,34:POSITION 27,2:? P
M$:POKE 82,2:POKE 83,40
11070 RETURN
13000 REM CONVERT PM$ TO PM DATA AND POKE TO
PM TABLE
13010 FOR T=0 TO 19
13020 PMCOUNT=0:RESTORE 13100:FOR N=1 TO 8
13030 READ A:IF PM$(T*8+N,T*8+N)=" " THEN PMC
OUNT=PMCOUNT+A
13040 NEXT N
13050 PMDAT$(T+1,T+1)=CHR$(PMCOUNT)
13060 NEXT T
13070 RETURN
13100 DATA 128,64,32,16,8,4,2,1
15000 REM SET UP PM DISPLAY
15005 FOR T=PMBASE*256+(512+((RES-1)*512)) TO
 PMBASE*256+(640+(RES-1)*640)):POKE T,0:NEXT T
15010 FOR T=1 TO 20
15020 POKE PMBASE*256+(576+((RES-1)*576))+T,A
SC(PMDAT$(T,T))
15030 NEXT T
15040 POKE 54279,PMBASE:REM TELL ANTIC
15050 POKE 559,VALDMACTL:REM TELL DMACTL
15060 POKE 53277,2:REM TELL GRACTL
15070 POKE 704,COLPO:REM COLOUR
15080 POKE 53248,HPO:REM HORIZ POS.
15090 RETURN
16000 REM ERASE POINT IN PM$
16010 PM$(COL-26+((ROW-2)*8),COL-26+((ROW-2)*
8))=" ":FOR T=1 TO 10:NEXT T:RETURN
17000 REM FILL POINT IN PM$
17010 PM$(COL-26+((ROW-2)*8),COL-26+((ROW-2)*
8))=" ":FOR T=1 TO 10:NEXT T:RETURN
20000 REM VIEW MAIN SUB LOOP
20010 ? "}":? "VIEW OPTION":? "PRESS START TO
 RETURN TO EDITOR"
20020 ? :? :? "JOYSTICK CONTROLS":? :? "-UP C
OLOUR":? "-LOWER COLOUR"
20030 ? "-DEC.LUMINANCE":? "-INC.LUMINANCE"
20040 ? :? :? "OPTION-SIZE":? "SELECT-RESOLUT
ION"
20050 ? :? :? "CURRENT COLOUR NO.  ";COLPO:?
"CURRENT SIZE          ";SIZE:? "CURRENT RESOLU
TION  "
20055 GOSUB 15000
20060 ST=STICK(0):IF ST=15 THEN 20200
20070 IF ST=14 THEN CL=CL+1-(CL>14)
20080 IF ST=13 THEN CL=CL-1+(CL<1)
20090 IF ST=11 THEN LM=LM-1+(LM<1)
20100 IF ST=7 THEN LM=LM+1-(LM>14)
20110 COLPO=CL*16+LM:POKE 704,COLPO
20120 POSITION 22,17:? COLPO;"  "
20130 FOR T=1 TO 50:NEXT T
20140 GOTO 20060
20200 CON=PEEK(53279):IF CON=7 THEN 20060
20210 IF CON<>3 THEN 20300
20220 IF SIZE=3 THEN SIZE=0:GOTO 20290
20230 IF SIZE=1 THEN SIZE=3:GOTO 20290
20240 IF SIZE=0 THEN SIZE=1:GOTO 20290
20290 POKE 53256,SIZE:POSITION 22,18:? SIZE;"
 ":FOR T=1 TO 50:NEXT T:GOTO 20060
20300 IF CON=6 THEN POKE 53248,10:GOTO 60
20310 IF CON<>5 THEN 20060
20320 IF RES=1 THEN RES=2:VALDMACTL=VALDMACTL
+16:GOTO 20340
20330 VALDMACTL=VALDMACTL-16:RES=1
20340 POSITION 22,19:IF RES=1 THEN ? "DOUBLE
 "
20350 IF RES=2 THEN ? "SINGLE "
20360 GOSUB 15000:GOTO 20060
```

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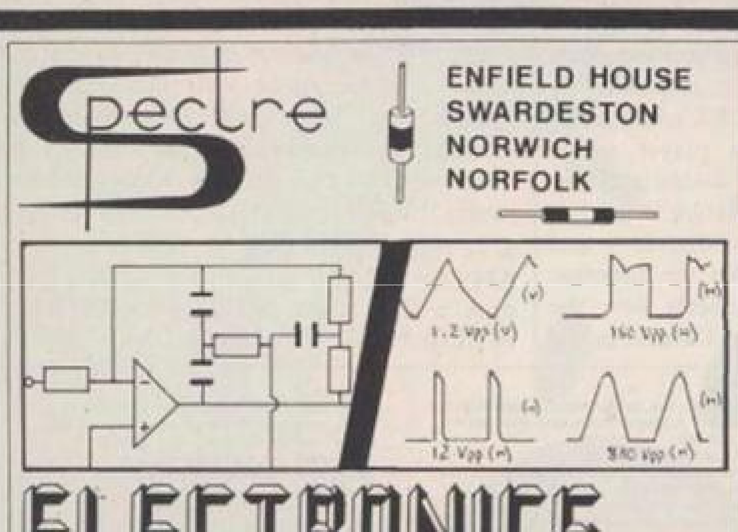
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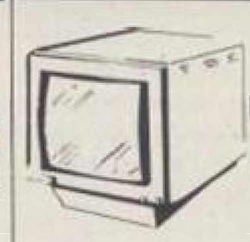
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To help you create hand-crafted machine code for the QL Philip Holliday delves deep into the machine.

DISASSEMBLER

The QL Disassembler.

```
10 REMark Copyright P.A.Holliday 1984
100 MODE 4:CSIZE 1,0:CLS
110 INPUT("Start address?") !
first$:first=2*INT(convert(first$)/2)
120 INPUT("End address?") ! last$:last=convert(last$)
130 INPUT("output device?") ! o$
140 IF o$="" THEN o$="con_448x200a32x16_128"
150 OPEN#15,o$
160 INPUT("Name of file of data areas?") ! f$
170 IF f$<>"" THEN
180    OPEN_IN#14,f$:get_t
190 ELSE
200    t1=last+2:t2=t1
210 END IF
220 IF o$(1 TO 3)=="con" OR o$(1 TO 3)=="scr" THEN
CLS#15
230 address=first
240 REPeat loop
250    IF address>last THEN EXIT loop
260    IF address=t2 THEN get_t
270    IF address >= t1 THEN
275    diss_data
280    ELSE
285    diss
290    END IF
295    address=address+2
300 END REPeat loop
310 CLOSE#15:STOP
1000 DEFine PROCedure diss
```

(listing continued on next page)

FINALLY THE QL arrived. The first task seemed to be to write a disassembler so that I could both delve into the inner workings of the machine and crack some of the QDOS operating system calls, and also check hand-assembled machine-code programs entered as data for correctness by disassembling the result. There is as yet no assembler available. The result is presented here.

Next month I will present the first of a three-part series on 68000 machine code.

The 68008 instruction set is extremely regular, making the job of writing the disassembler a relatively straightforward one, both from the point of view of length of the resulting program and also from the time taken to test it. In fact the disassembler consists in the main of select statements — SuperBasic equivalent of the case or switch construct available in most structured languages — which breaks the opcode down until the actual instruction has been found, together with a set of functions which enable the whole of the instruction to be synthesised from the code.

Motorola mnemonics have been used throughout. A # character preceding a number indicates that it is immediate data; a $ prefixing a number indicates that hex notation is being used. This disassembler presents all numbers in hex. A suffix of .B , .W or .L indicates that the instruction operates on byte

(continued on next page)



(continued from previous page)

— 8 bits; word — 16 bits — or long word — 32 bits of data respectively.

After entering and saving the program it can be run. It prompts for the start and end addresses of the section of code to be disassembled. These addresses can be entered in decimal, or in hex by prefixing the response with a $. The letters A to F can be entered in upper or lower case.

Try a start address of $168 which is where the QL initially starts execution. It will then prompt for the output device. Just hit Enter for output to the console or else the output device name, i.e., SER1 for output to a printer if you have one. The last prompt is for the name of a Microdrive file which contains pairs of addresses of start and end of blocks of text or data which should not be disassembled as instructions.

This file can be generated simply by opening it and printing addresses to it, and then closing it again. Alternatively you can use Quill to edit the contents of this file. However certain points must be borne in mind. There must be no empty lines, no header or footer and only one entry per line.

The file must be generated by using the Quill Print command, and the installed print driver should not generate any preamble code. If you do not wish to specify a file containing text and data addresses hit Enter.

The assembly listing produced is in four fields. The address field — 5 bytes — and opcode field — 2 to 10 bytes — are both displayed in hex but without a $ prefix. The instruction itself is next, followed by an error message which is given if an illegal or unimplemented instruction is found. Note that the error-checking in this disassembler is by no means exhaustive.

For those of you who do not have the energy to type out the program the author is prepared to copy it onto your supplied Microdrive cartridge. Please state whether the cartridge is formatted or not and include £2.00 to cover postage, packing and time. Send it to Philip Holliday, 44 Lennard Road, London SE20 7LX.

(listing continued from previous page)

```
1010   instr=PEEK_W(address):IF instr<0 THEN
instr=instr+65536
1020
addr$=address$(address):obj$=word$(instr):er$=""
1030   instr_type=INT(instr/4096):LET
opfield=instr-instr_type*4096
1040   SELect ON instr_type
1050     =0:op$=bit_man$
1060     =1:op$=move$(0)
1070     =2:op$=move$(2)
1080     =3:op$=move$(1)
1090     =4:op$=misc$
1100     =5:op$=add_sub$
1110     =6:op$=branch$
1120     =7:op$=moveq$
1130     =8:op$=or_div$
1140     =9:op$=sub_subx$
1150     =11:op$=cmp_eor$
1160     =12:op$=and_mul$
1170     =13:op$=add_addx$
1180     =14:op$=shift_rot$
1190     =REMAINDER :op$="":er$=er$ & "unassigned op
code"
1200   END SELect
1210   PRINT#15,addr$ ! obj$ TO 27; op$ ! er$
1220 END DEFine diss
5000 DEFine FuNction hex$(a)
5010   RETurn CHR$(a+48+7*(a>9))
5020 END DEFine hex$
5030 DEFine FuNction address$(x)
5040   LOCal y
5050   y=INT(x/65536)
5060   RETurn hex$(y) & word$(x-65536*y)
5070 END DEFine address$
5080 DEFine FuNction word$(x)
5090   LOCal y,z
5100   z=x
5110   IF z<0 THEN z=z+65536
5120   y=INT(z/256)
5130   RETurn byte$(y) & byte$(z-256*y)
5140 END DEFine word$
5150 DEFine FuNction byte$(x)
5160   LOCal x%
5170   x%=x-256*INT(x/256)
5180   RETurn hex$(x% DIV 16) & hex$(x% MOD 16)
5190 END DEFine byte$
5200 DEFine FuNction eff_addr$(eff_mod,reg,size)
5210   LOCal x
5220   SELect ON eff_mod
5230     =0:RETurn "D" & reg
5240     =1:RETurn "A" & reg
5250     =2:RETurn "(A" & reg & ")"
5260     =3:RETurn "(A" & reg & ")+"
5270     =4:RETurn "-(A" & reg & ")"
5280     =5:RETurn "$" & s_word$(advance) & "(A" & reg
& ")"
5290     =6:x=advance
5300     IF x < 0 THEN
5310     d_a$ ≠ "A"
5320     ELSE
5330     d_a$ = "D"
5340     END IF
5350     IF x && 2048
5360     w_l$ = ".L"
5370     ELSE
5380     w_l$ = ".W"
5390     END IF
5400     RETurn "$" & s_byte$(x) & "(A" & reg & ", " &
d_a$ & (INT(x/4096) MOD 8) & w_l$ & ")"
5410     =7:SELect ON reg
5420       =0:RETurn "$" & word$(advance)
5430       =1:RETurn "$" & word$(advance) &
word$(advance)
5440       =2:x=advance:RETurn "$" &
address$(address+x)
5450       =3:x=advance
5460       IF x<0
5470       d_a$ = "A"
5480       ELSE
5490       d_a$ = "D"
5500       END IF
5510       IF x && 2048
5520       w_l$ = ".L"
5530       ELSE
5540       w_l$ = ".W"
5550       END IF
5560       RETurn "$" & s_byte$(x) &"(PC," & d_a$ &
(INT(x/4096) MOD  8)& w_l$ & ")"
5570       =4:RETurn immediate$(size)
5580     = REMAINDER :er$=er$ & "eff addr
error":RETurn ""
5590     END SELect
5600   END SELect
5610 END DEFine eff_addr$
5620 DEFine FuNction source_ea$(size)
5630   LOCal x,y
5640   x=opfield DIV 8 MOD 8:y=opfield MOD 8
5650   RETurn eff_addr$(x,y,size)
5660 END DEFine source_ea$
5670 DEFine FuNction dest_ea$(size)
5680   LOCal x,y
5690   x=opfield DIV 64 MOD 8:y=opfield DIV 512
5700   RETurn eff_addr$(x,y,size)
5710 END DEFine dest_ea$
5720 DEFine FuNction size$
5730   LOCal x
5740   x = opfield DIV 64 MOD 4
5750   SELect ON x
5760     =0:RETurn ".B"
5770     =1:RETurn ".W"
5780     =2:RETurn ".L"
5790     =REMAINDER :er$=er$ & "error in size
field":RETurn ""
5800   END SELect
5810 END DEFine size$
5820 DEFine FuNction condition$
5830   LOCal x
5840   x=opfield DIV 256 MOD 16
5850   SELect ON x
5860     =0:RETurn "T"
5870     =1:RETurn "F"
5880     =2:RETurn "HI"
5890     =3:RETurn "LS"
5900     =4:RETurn "CC"
5910     =5:RETurn "CS"
5920     =6:RETurn "NE"
5930     =7:RETurn "EQ"
5940     =8:RETurn "VC"
5950     =9:RETurn "VS"
5960     =10:RETurn "PL"
```

(continued on page 136)

What the competition hasn't been waiting for.

Latest version of Forth for the BBC (Is not rehashed Forth 79 Code)

Unique Stack Display Utility



16k Eprom type 27128

Multi-tasking operating system for Real-Time use.

Here's the Forth Eprom for the BBC Micro that makes all others out of date.

It's Multi-Forth 83 from David Husband who has built his reputation for Quality Forth products with his ZX81-Forth ROM, Spectrum Forth-I/O Cartridge and now New Multi-Forth 83 for the BBC Micro. This is not rehashed Forth 79 Code, but a completely new version of the Forth 83 Standard. It's unique in that it Multi-tasks, and therefore the user can have a number of Forth programs executing simultaneously and transparently of each other.

Multi-Forth 83 sits in the sideways ROM area of the BBC along with any other ROMs in use. It is compatible with the MOS, and specially vectored to enable a system to be reconfigured. It contains a Standard 6502 Assembler, a Standard Screen Editor, and a Unique Stack Display Utility.

With this Forth, David Husband has provided the BBC Micro with capabilities never before realised. And being 16K rather than 8K is twice the size of other versions. Multi-Forth 83 is supplied with an extensive Manual (170 pages plus) and at £45+VAT it is superb value.

Order it using the coupon adding £2.30 p&p (£5 for Europe, £10 outside) or if you want more information, tick that box instead. Either way, it will put you one step ahead of the competition.

Please send me Multi-Forth 83 for BBC Micro. £45+VAT. De-luxe System inc. Disc £80+VAT.
Cheques to Skywave Software Readers' A/C (or enter Visa No.)

Name ____________

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Please send me more information:
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MULTI-FORTH 83 FOR THE BBC MICRO

IT TRANSFORMS THE HOME COMPUTER OUT OF ALL RECOGNITION

Because Touchmaster is a touch sensitive surface which effectively bypasses the keyboard, it has none of the keyboard's complications, typing skill requirements or potential errors.

To operate Touchmaster, you simply slide an overlay onto its surface, load the matching Touchware into your computer and touch the overlay.

For repeatability and resolution, no other ostensibly comparable pads can touch Touchmaster.

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Other pads might fairly be described as peripherals. Touchmaster goes a lot further: it respecifies the home computer.



Now anyone can master the home computer

TOUCHMASTER

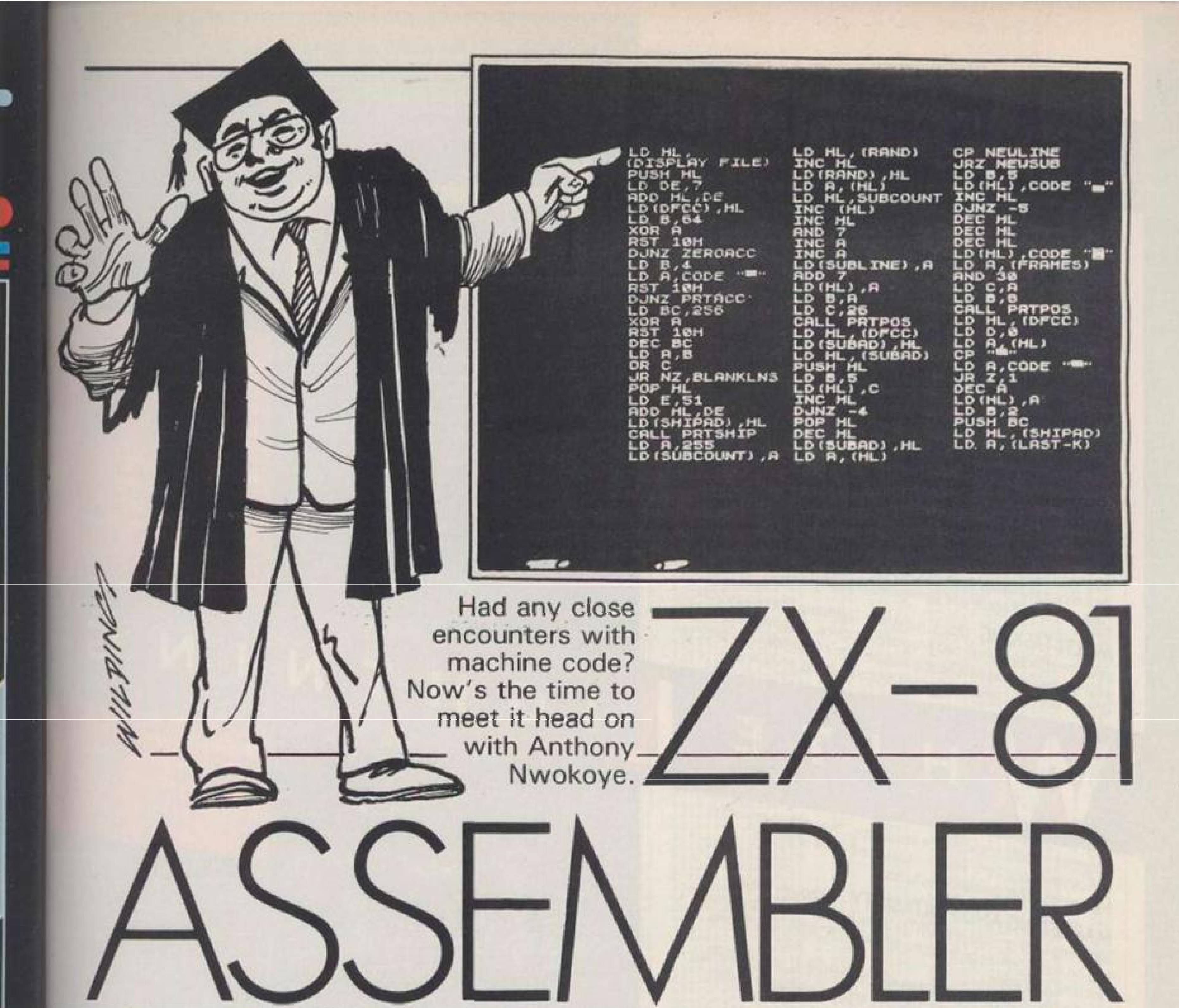
For full details, contact **Touchmaster Limited, PO Box 3, Port Talbot, West Glamorgan SA13 1WH,** or phone **Teledata (01) 200 0200**

(continued from page 134)

```
5970      =11:RETurn "MI"
5980      =12:RETurn "GE"
5990      =13:RETurn "LT"
6000      =14:RETurn "GT"
6010      =15:RETurn "LE"
6020   END SELect
6030 END DEFine condition$
6040 DEFine FuNction displ$
6050   LOCal x
6060   x=opfield MOD 256
6070   IF x<>0 THEN
6080     IF x>127 THEN LET x=x-256
6090     RETurn "$" & address$(address + x + 2)
6100   ELSE
6110     x=advance
6120     RETurn "$" & address$(address + x)
6130   END IF
6140 END DEFine displ$
6150 DEFine FuNction dat$
6160   LOCal x
6170   x=opfield DIV 512
6180   IF x=0 THEN x=8
6190   RETurn "#" & x
6200 END DEFine dat$
6210 DEFine FuNction displ16$
6220   RETurn "$" & address$(address + advance)
6230 END DEFine displ16$
6240 DEFine FuNction immediate$(size)
6250   LOCal x,y
6260   x=advance
6270   SELect ON size
6280    ON size=0
6290      x=x MOD 256
6300      IF x < 128 THEN
6310         RETurn "#$" & byte$(x)
6320         ELSE RETurn "#$-" & byte$(256-x)
6330      END IF
6340     ON size=1
6350     IF x>=0 THEN
6360       RETurn "#$" & word$(x)
6370     ELSE
6380       RETurn "#$-" & word$(2^16-x)
6390     END IF
6400     ON size=2
6410       y=advance
6420       IF x<0 THEN
6430         IF y<>0 THEN y=2^16-y
6440         x=2^16-(x + NOT y)
6450         RETurn "#$-" & word$(x) & word$(y)
6460         ELSE
6470         RETurn "#$" & word$(x) & word$(y)
6480         END IF
6490     =REMAINDER :er$=er$ & "size field
error":RETurn ""
6500   END SELect
6510 END DEFine immediate$
6520 DEFine FuNction type$
6530   LOCal x
6540   x=opfield DIV 64 MOD 4
6550   SELect ON x
6560     =0:RETurn "TST"
6570     =1:RETurn "CHG"
6580     =2:RETurn "CLR"
6590     =3:RETurn "SET"
6600   END SELect
6610 END DEFine type$
6620 DEFine FuNction sz$
6630   IF opfield && 64 THEN RETurn ".L"
6640   ELSE RETurn ".W"
6650   END IF
6660 END DEFine sz$
6670 DEFine FuNction advance
6680   LOCal x
6690   address=address+2:x=PEEK_W(address):obj$=obj$ &
word$(x)
6700   RETurn x
6710 END DEFine advance
6720 DEFine FuNction direction$
6730   IF opfield && 256
6740   RETurn "L"
6750   ELSE
6760   RETurn "R"
6770   END IF
6780 END DEFine direction$
6790 DEFine FuNction shift$
6800   LOCal x
6810   x=opfield DIV 512 MOD 4
6820   SELect ON x
6830     =0:RETurn "AS"
6840     =1:RETurn "LS"
6850     =2:RETurn "ROX"
6860     =3:RETurn "RO"
6870   END SELect
6880 END DEFine shift$
6890 DEFine FuNction convert(string$)
6900   LOCal x,y,z,base
6910   IF string$(1) <> "$"
6920   base=10
6930   ELSE
6940   base=16:string$=string$(2 TO )
6950   END IF
6960   x=0
6970   FOR y=1 TO LEN(string$)
6980   z=CODE(string$(y))
6990   SELect ON z
7000     =48 TO 57:z=z-48
7010     =65 TO 70:z=z-55
7020     =97 TO 102:z=z-87
7030     =REMAINDER :PRINT "not acceptable number"
7040   END SELect
7050   x=x * base + z
7060   END FOR y
7070   RETurn x
7080 END DEFine convert$
7090 DEFine PROCedure diss_data
7100   word=PEEK_W(address)
7110   PRINT#15,address$(address)! word$(word)
7120 END DEFine diss_data
7130 DEFine PROCedure get_t
7140   IF NOT EOF(#14)
7150   INPUT #14,t1
7160   ELSE
7170   t1=last+2
7180   END IF
7190   IF NOT EOF(#14)
7200   INPUT #14,t2
7210   ELSE
7220   t2=last+2
7230   END IF
7240   t1=2*INT(t1/2):t2=2*INT(t2/2)
7250 END DEFine get_t
7260 DEFine FuNction s_word$(x)
7270   LOCal y
7280   IF x<0
7290    y=2^16-x
7300     RETurn "-" & word$(y)
7310   ELSE
7320     RETurn word$(x)
7330   END IF
7340 END DEFine s_word$
7350 DEFine FuNction s_byte$(x)
7360   LOCal y
7370   y=x && 255
7380   IF y>127
7390     RETurn "-" & byte$(256-y)
7400   ELSE
7410     RETurn byte$(y)
7420   END IF
7430 END DEFine s_byte$
7440 DEFine FuNction multiple$
7450   LOCal a$,i,x,y
7460   x=advance
7470   a$="":i=0
7480   IF opfield>=2240 AND opfield<=2247 THEN
x=reverse(x)
7490   IF x<0 THEN x=x+2^16
7500     FOR i = 0 TO 15
7510     y=(x/4-INT(x/4))*4
7520     SELect ON y
7530       =1:a$=a$ & CHR$(68-3*(i DIV 8)) & (i MOD 8)
7540       =2:IF a$<>"" THEN a$=a$ & "/"
7550       =3:IF a$(LEN(a$))<>"-" THEN a$=a$ &
CHR$(68-3*(i DIV 8)) & (i MOD 8) & "-"
7560       END SELect
7570       x=INT(x/2)
7580   END FOR i
7590   RETurn a$
7600 END DEFine multiple$
7610 DEFine FuNction reverse(x)
7620   LOCal i,y,z
7630   y=0
7640   IF x<0 THEN x=x+2^16
7650   FOR i=0 TO 15
7660   x=(INT(x))/2
7670   y=y+(x-INT(x))*2^(16-i)
7680   END FOR i
7690   IF x>=2^15 THEN x=x-2^16
7700   RETurn y
7710 END DEFine reverse
10000 DEFine FuNction move$(size)
10010 LOCal m$
10020 m$="MOVE":IF opfield DIV 64 MOD 8=1 THEN
m$="MOVEA"
10030   SELect ON size
10040       =0:RETurn m$ & ".B " & source_ea$(size) &
"," & dest_ea$(size)
10050       =1:RETurn m$ & ".W " & source_ea$(size) &
"," & dest_ea$(size)
10060       =2:RETurn m$ & ".L " & source_ea$(size) &
"," & dest_ea$(size)
10070    END SELect
10080 END DEFine move$
10090 DEFine FuNction branch$
10100  LOCal x
10110    x=opfield DIV 256
10120    SELect ON x
10130    =0:RETurn "BRA " & displ$
10140    =1:RETurn "BSR " & displ$
10150    =REMAINDER :RETurn "B" & condition$ & " " &
displ$
10160    END SELect
10170 END DEFine branch$
10180 DEFine FuNction add_sub$
10190   LOCal x,size
10200   size=opfield DIV 64 MOD 4
10210   x=opfield DIV 8 MOD 64
10220   SELect ON x
10230     =0 TO 23:RETurn "ADDQ" & size$ & " " & dat$
& "," & source_ea$(size)
10240     =32 TO 55:RETurn "SUBQ" & size$ & " " & dat$
& "," & source_ea$(size)
10250     =25,57:RETurn "DB" & condition$ & " " & "D"
& (opfield MOD 8) & "," & displ16$
10260     =REMAINDER :RETurn "S" & condition$  & " " &
source_ea$(0)
10270   END SELect
10280 END DEFine add_sub$
10290 DEFine FuNction moveq$
10300   RETurn "MOVEQ #$" & s_byte$(opfield MOD 256) &
",D" & (opfield DIV 512)
10310 END DEFine moveq$
10320 DEFine FuNction bit_man$
10330   LOCal x,y,size
10340   x=opfield DIV 256
10350   size=opfield DIV 64 MOD 4
10360   SELect ON x
10370      =0:RETurn "ORI" & size$ & " " &
immediate$(size) & "," & source_ea$(size)
10380      =2:RETurn "ANDI" & size$ & " " &
immediate$(size) & "," & source_ea$(size)
10390      =4:RETurn "SUBI" & size$ & " " &
immediate$(size) & "," & source_ea$(size)
10400      =6:RETurn "ADDI" & size$ & " " &
immediate$(size) & "," & source_ea$(size)
10410      =8:RETurn "B" & type$ & " " &
immediate$(size) & "," & source_ea$(size)
10420      =10:RETurn "EORI" & size$ & " " &
immediate$(size) & "," & source_ea$(size)
10430      =12:RETurn "CMPI" & size$ & " " &
immediate$(size) & "," & source_ea$(size)
10440      =REMAINDER :y=opfield DIV 8 MOD 8
10450      SELect ON y
10460        =1:RETurn movep$
10470        =REMAINDER :RETurn "B" & type$ & " " & "D"
& (opfield DIV 512 MOD 8) & "," & source_ea$(size)
10480      END SELect
10490   END SELect
10500 END DEFine bit_man$
10510 DEFine FuNction movep$
10520   LOCal x
10530   x=opfield DIV 64 MOD 8
10540   SELect ON x
10550      =4:RETurn "MOVEP.W " & displ16$ & "(A" &
(opfield MOD 8) & ")" & "," & "D" & (opfield DIV 512)
10560      =5:RETurn "MOVEP.L " & displ16$ & "(A" &
(opfield MOD 8) & ")" & "," & "D" & (opfield DIV 512)
10570      =6:RETurn "MOVEP.W " & "D" & (opfield DIV
512) & "," & displ16$ & "(A" & (opfield MOD 8) & ")"
10580      =7:RETurn "MOVEP.L " & "D" & (opfield DIV
512) & "," & displ16$ & "(A" & (opfield MOD 8) & ")"
10590   END SELect
10600 END DEFine movep$
10610 DEFine FuNction misc$
10620   LOCal x,size,t$
10630   size=opfield DIV 64 MOD 4
10640   SELect ON opfield
10650      =0 TO 191:RETurn "NEGX" & size$ & " " &
source_ea$(size)
10660      =192 TO 255:RETurn "MOVE SR," &
source_ea$(1)
10670      =512 TO 703:RETurn "CLR" & size$ & " " &
source_ea$(size)
10680      =1024 TO 1215:RETurn "NEG" & size$ & " " &
source_ea$(size)
10690      =1216 TO 1279:RETurn "MOVE.W " &
source_ea$(1) & ",CCR"
10700      =1536 TO 1727:RETurn "NOT" & size$ & " " &
source_ea$(size)
10710      =1728 TO 1791:RETurn "MOVE.W " &
source_ea$(1) & ",SR"
10720      =2048 TO 2111:RETurn "NBCD.B " &
source_ea$(0)
10730      =2112 TO 2119:RETurn "SWAP D" & (opfield MOD
8)
10740      =2120 TO 2175:RETurn "PEA.L " &
source_ea$(2)
10750      =2176 TO 2183:RETurn "EXT.W D" & (opfield
MOD 8)
10760      =2184 TO 2239,2248 TO 2303:RETurn "MOVEM" &
sz$ & " " & multiple$ & "," & source_ea$(size-1)
10770      =2240 TO 2247:RETurn "EXT.L D" & (opfield
MOD 8)
10780      =2560 TO 2751:RETurn "TST" & size$ & " " &
source_ea$(size)
10790      =2752 TO 2815:RETurn "TAS.B " &
source_ea$(0)
10800      =3200 TO 3327:t$=multiple$:RETurn "MOVEM" &
sz$ & " " & source_ea$(size-1) & "," & t$
10810      =3648 TO 3663:RETurn "TRAP #" & byte$(
opfield MOD 16)
10820      =3664 TO 3671:RETurn "LINK A" & (opfield MOD
8) & ",#" & s_word$(advance)
10830      =3672 TO 3679:RETurn "UNLK A" & (opfield MOD
8)
10840      =3680  TO 3687:RETurn "MOVE USP,A" &
(opfield MOD 8)
10850      =3688 TO 3695:RETurn "MOVE A" & (opfield MOD
8) & ",USP"
10860      =3696:RETurn "RESET"
10870      =3697:RETurn "NOP"
10880      =3698:RETurn "STOP " & immediate$(1)
10890      =3699:RETurn "RTE"
10900      =3701:RETurn "RTS"
10910      =3702:RETurn "TRAPV"
10920      =3703:RETurn "RTR"
10930      =3712 TO 3775:RETurn "JSR " & source_ea$(1)
10940      =3776 TO 3839:RETurn "JMP " & source_ea$(1)
10950      =REMAINDER :x=opfield DIV 64 MOD 8
10960      SELect ON x
10970        =6:RETurn "CHK " & source_ea$(1) & ",D" &
(opfield DIV 512)
10980        =7:RETurn "LEA " & source_ea$(2) & ",A" &
(opfield DIV 512)
10990        =REMAINDER :er$=er$ & "error in misc
group":RETurn ""
11000      END SELect
11010   END SELect
11020 END DEFine misc$
11030 DEFine FuNction sub_subx$
11040    RETurn "SUB" & com_add_sub$
11050 END DEFine sub_subx$
11060 DEFine FuNction add_addx$
11070    RETurn "ADD" & com_add_sub$
11080 END DEFine add_addx$
11090 DEFine FuNction com_add_sub$
11100    LOCal x,y,size
11110    x=opfield DIV 8 MOD 64
11120    size=opfield DIV 64 MOD 4
11130    SELect ON x
11140      =32,40,48:RETurn "X" & size$ & " " & "D" &
(opfield MOD 8) & ",D" & (opfield DIV 512)
11150      =33,41,49:RETurn "X" & size$ & " " & "-(A" &
(opfield MOD 8) & ")" & ",-(A" & (opfield DIV 512) &
")"
11160      =REMAINDER :y=opfield DIV 64 MOD 8
11170      SELect ON y
11180        =0 TO 2:RETurn " " & source_ea$(size) &
",D" & (opfield DIV 512)
11190        =3:RETurn "A.W " & source_ea$(1) & ",A" &
(opfield DIV 512)
11200        =4 TO 6:RETurn  " D" & (opfield DIV 512) &
"," & source_ea$(size)
11210        =7:RETurn "A.L " & source_ea$(2) & ",A" &
(opfield DIV 512)
11220      END SELect
11230   END SELect
11240 END DEFine com_add_sub$
11250 DEFine FuNction cmp_eor$
11260   LOCal x,y,size
11270   x=opfield DIV 64 MOD 8:size=x MOD 4
11280   SELect ON x
11290     =0 TO 2:RETurn "CMP" & size$ & " " &
source_ea$(size) & ",D" & (opfield DIV 512)
11300     =3:RETurn "CMPA.W " & source_ea$(1) & ",A" &
(opfield DIV 512)
11310     =7:RETurn "CMPA.L " & source_ea$(2) & ",A" &
(opfield DIV 512)
11320     =REMAINDER :y=opfield DIV 8 MOD 64
11330     SELect ON y
11340       =33,41,49:RETurn "CMPM" & size$ & "(A" &
(opfield MOD 8) & ")+,(A" & (opfield DIV 512) & ")+"
11350       =REMAINDER :RETurn "EOR" & size$ & " D" &
(opfield DIV 512) & "," & source_ea$(size)
11360     END SELect
11370   END SELect
11380 END DEFine cmp_eor$
11390 DEFine FuNction shift_rot$
11400   LOCal x,y,z
11410   x=opfield DIV 64 MOD 4
11420   SELect ON x
11430     =3:RETurn shift$ & direction$ & size$ & " "
& source_ea$(1)
11440     =REMAINDER :y=opfield DIV 32 MOD 2
11450     SELect ON y
11460       =0:z=opfield DIV 512:IF z=0 THEN LET z=8
11470       RETurn shift$ & direction$ & size$ & " #"
& z & ",D" & (opfield MOD 8)
11480       =1:z=opfield DIV 512
11490       RETurn shift$ & direction$ & size$ & " D"
& z & ",D" & (opfield MOD 8)
11500     END SELect
11510   END SELect
11520 END DEFine shift_rot$
11530 DEFine FuNction or_div$
11540   LOCal x,y,size
11550   x=opfield DIV 64 MOD 8
11560   SELect ON x
11570     =3:RETurn "DIVU " & source_ea$(1) & ",D" &
(opfield DIV 512)
11580     =7:RETurn "DIVS " & source_ea$(1) & ",D" &
(opfield DIV 512)
11590     =REMAINDER :y=opfield DIV 8 MOD 64:size=x
MOD 4
11600     SELect ON y
11610       =0 TO 23:RETurn "OR" & size$ & " " &
source_ea$(size) & ",D" & (opfield DIV 512)
11620       =32:RETurn "SBCD D" & (opfield MOD 8) &
",D" & (opfield DIV 512)
11630       =33:RETurn "SBCD -(A" & (opfield MOD 8) &
"),-(A" & (opfield DIV 512) & ")"
11640       =REMAINDER :RETurn "OR" & size$ & " D" &
(opfield DIV 512) & "," & source_ea$(size)
11650     END SELect
11660   END SELect
11670 END DEFine or_div$
11680 DEFine FuNction and_mul$
11690   LOCal x,y,size
11700   x=opfield DIV 64 MOD 8
11710   SELect ON x
11720     =3:RETurn "MULU " & source_ea$(1) & ",D" &
(opfield DIV 512)
11730     =7:RETurn "MULS " & source_ea$(1) & ",D" &
(opfield DIV 512)
11740     =REMAINDER :y=opfield DIV 8 MOD 64:size=x
MOD 4
11750     SELect ON y
11760       =0 TO 23:RETurn "AND" & size$ & " " &
source_ea$(size) & ",D" & (opfield DIV 512)
11770       =32:RETurn "ABCD D" & (opfield MOD 8) &
",D" & (opfield DIV 512)
11780       =33:RETurn "ABCD -(A" & (opfield MOD 8) &
"),-(A" & (opfield DIV 512) & ")"
11790       =40:RETurn "EXG D" & (opfield DIV 512) &
",D" & (opfield MOD 8)
11800       =41:RETurn "EXG A" & (opfield DIV 512) &
",A" & (opfield MOD 8)
11810       =49:RETurn "EXG D" & (opfield DIV 512) &
",A" & (opfield MOD 8)
11820       =REMAINDER :RETurn "AND" & size$ & " D" &
(opfield DIV 512) & "," & source_ea$(size)
11830     END SELect
11840   END SELect
11850 END DEFine and_mul$
```



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Had any close encounters with machine code? Now's the time to meet it head on with Anthony Nwokoye.

ZX-81 ASSEMBLER

THIS PROGRAM WAS written for ZX-81 owners who would like to move on to machine code but who do not want to buy all the necessary assemblers, monitor, etc. It only occupies 3.75K of memory, above RAMtop, and has features you would expect to find from the top commercial products. These features are:

- The ability to assemble any Z-80 instruction — pages 181 to 187 of ZX-81 Basic Manual.
- It assembles to any part of the memory.
- It handles all labels, including those which require 16-bit address.
- It accepts decimal, hex or binary numbers.
- The ability to have messages imbedded in your code by putting the message between quotes.
- Comments and reminders may be placed after an asterisk. You can also have multiple instruction, with each separated by a semi-colon — the whole code could be assembled from one line.

With these facilities, it would make it easier to write fast and smooth arcade-type games, and improve your machine-code techniques.

The machine code itself is stored in a Rem line 3,871 bytes long. This is obtained by first entering

1 REM 221 characters.

then edit line 1 and change it to 2 and edit 2 and change it to 3 and so on, until you have 1 to 17 lines.

Then add

18 REM 7 characters

then you POKE 16512,15
POKE 16511,28

then you enter the hex loader. Once you've entered the code and saved it to tape you can try out the assembler.

Load the program. When it has been loaded you should list it. You will see a long Rem statement followed by a mixture of weird characters. This is the machine-code assembler and the computer is only listing the first 400 bytes or so of the code. This code needs to be about RAMtop, so to do this you type:

PRINT USR 16514 . . . (Newline)

and then you will see the computer New itself as it sends the code above RAMtop and clear itself.

Now that the computer is clear and the machine code is above RAMtop, you are ready to enter your mnemonics. I am going to have difficulty explaining this, so please stay awake!

Before entering your mnemonics, you need to enter a Rem line that is suitable to hold the code. The code does not have to start at 16514, it can start at, say, 22000. Before any mnemonics are entered you need a Rem line with an opening bracket, so the assembler knows where the code begins such as;

1 Rem . . . necessary bytes
10 Rem (open brackets

(continued on page 143)

The Hex Loader

```
 99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```


THE KEY TO PROFESSIONAL GAMES DESIGN
ON THE SPECTRUM 48K
THE GAMES LANGUAGE OF THE 80'S!
Now, without any knowledge of machine code, you can write fast, smooth, professional, totally original games and market them without paying royalties.
Even if you have already mastered machine code, we believe that the time and problems saved by writing in White Lightning's FORTH– based high level language could revolutionise commercial games writing for years to come.
IDEAL IDEAL is an Interrupt Driven Extendible Animation sub-Language. Once you have mastered IDEAL's easy to learn set of over 80 commands and just a little FORTH, you will be ready to produce arcade-quality games even if you don't know machine code. Up to 255 Sprites, each with its own user-defined dimensions can be moved around the screen (or memory), scrolled, spun, reflected enlarged or inverted with amazing speed and smoothness. Operations are possible between screen windows, Sprites and Sprite windows. Sprites can even stretch across several screens, so those difficult scrolling landscapes that form the basis of so many games are easy to achieve. Sinclair's own sound and graphics commands such as CIRCLE, DRAW and BEEP are fully supported, and there are some unique collision detection facilities.
MULTI-TASKING Because White Lightning uses interrupts, you can effectively run two programs at once. This means of course, that games like Space Invaders and Defender can be written without complex timing calculations. So while one program smoothly scrolls the landscape, the second animates the other characters. This is undoubtedly one of White Lightning's most powerful features.
WHITE LIGHTNING
MARKETING AND PORTABILITY Although White Lightning uses an integer FORTH as its host language, programs can be written in a combination of BASIC, FORTH, IDEAL and machine language.
What is more, programs written in FORTH/IDEAL will be highly portable between the Spectrum and implementations under development for other popular micros.
When it comes to marketing your completed games, there's no problem either. In fact Oasis themselves will offer to market outstanding software.
SPRITE DESIGN White Lightning, comes complete with a separate 20K program for developing the Sprites used in the main system. Not only can you use this to design your own Sprites from scratch, it also comes complete with 168 pre-defined characters covering games like Asteroids, Pac-Man, Assault Course, Defender, Space Invaders, City Bomber, Lunar Lander, Frogger, Centipede, Donkey Kong and many, many, more. These characters are ready to use or can be enhanced. And Sprites can be saved to tape between editing sessions before being finally loaded into the main program.
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YC 10

(continued from page 141)

all mnemonics are entered in Rem lines like so:

1 Rem . . .
10 Rem (
20 Rem Ld A.0

to have multiple statements use a semicolon:

1 Rem . . .
10 Rem (
20 Rem LD A.0; RST16; BIT 7.(HL); etc

The use of labels makes any assembler, without doubt, much easier to use. They are used in instructions like JR or DJNZ, and you can even have 16-bit labels where the computer fills in the necessary two bytes. To enter a label you have to type a colon followed by an L and then the label number, and then again a colon. You have to do this before the required statement, like so:

1 Rem . . .
10 Rem (
20 Rem: L1:INC HL; JR L1

The label number can be anything from 0 to 255 and must not exceed these values as the labelling system won't work correctly.

Now for the 16-bit label. In an operation like so:

1 Rem . . .
10 Rem (
20 Rem :LO:SET 7.A;XORA etc . . .

(continued on next page)

Assembler hex dump

16514	11A86CED53044021	=	717
16522	9440010A0FED60C3	=	846
16530	C303CD347ACD176E	=	915
16538	ED43FC7F21000022	=	750
16546	F87F213F4022F37F	=	939
16554	3E0032F77F210000	=	519
16562	22F57F21466D22F1	=	893
16570	7F2AF37F36002336	=	682
16578	002AFC7F22ED7F23	=	854
16586	7EFE762806FE1928	=	863
16594	0218F422E37F1106	=	686
16602	007EF27628031101	=	559
16610	001922FC7F2AED7F	=	844
16618	7EFE0ECC2870FE08	=	1018
16626	2005CD775E18A8FE	=	920
16634	11CAE18DFE1728C1	=	1063
16642	CD2F6ECDF67978FE	=	1308
16650	27CA607079C61432	=	851
16658	3E40CD2F6E2AF37F	=	900
16666	7EFE1C20042AF17F	=	854
16674	E92A8C797EFE10CA	=	1182
16682	9E6EC3C06E214040	=	935
16690	22F37F21546D22F1	=	905
16698	7F18D73A3E40FE4A	=	878
16706	D2B860FE403805FE	=	1139
16714	4ADAA56DCD127A78	=	1031
16722	FE27CA886D2AFE7F	=	1214
16730	79773AF77FFE0128	=	967
16738	12FE0223192322FE	=	662
16746	7F2AF87F2322F87F	=	988
16754	C3B86C8AFE7F233A	=	1006
16762	F57F77C37E6D2AFE	=	1217
16770	7F23ED48F57F7123	=	994
16778	70C37E6DCD207A78	=	1021
16786	FE27CA6D702AFE7F	=	1139
16794	36CB237122FE7FC3	=	1015
16802	736D217D7936C823	=	792
16810	3678CD7C7973FE27	=	1037
16818	CA6D702AFE7F36ED	=	1137
16826	E61321727B097E12	=	677
16834	E822FE7F7FC3736D	=	1198
16842	3AD278FE00C49A6F	=	1108
16850	3AD378FE00C4606F	=	1062
16858	11F76DC370703134	=	893
16866	3435002620283432	=	325
16874	35312E382D2A2918	=	359
16882	0000000000000000	=	0
16890	0000000000000180	=	129
16898	40030AFEEA20FA03	=	850
16906	0AFE1020F4C5E111	=	995
16914	070019E5C1C92AED	=	934
16922	7FED4BE37F7CB820	=	1138
16930	057080D2946E2AED	=	1052
16938	7F2A8C791E002AED	=	779
16946	7F7EFE00281CFE18	=	856
16954	2818ED4BE87F78BC	=	1043
16962	2006798D2002180A	=	416
16970	2AED7F2322ED7F1C	=	867
16978	180C2AED7F2322ED	=	956
16986	7F7B327940C9ED5B	=	1014
16994	ED7F132AFE7F1AFE	=	1056
17002	08280577231318F6	=	499
17010	22FE7F2AF87F2322	=	901
17018	F87FC92AF37F3E1C	=	1078
17026	77C90000002ABC79	=	671
17034	237EFE280259703E	=	926
17042	0A32E2707EFE1720	=	833
17050	053E1032E270CDA1	=	837
17058	702AF37F3E3C773E	=	827
17066	0232F77F2AF17FE9	=	1069
17074	213E407EFE47CA59	=	901
17082	70FE49CA5970FE48	=	1168
17090	CA5970FE4DCA5970	=	1137
17098	FE2FCAE36FFE20CA	=	1334
17106	E86F2A8C797EFE31	=	1123
17114	2010237EFE1C300A	=	557
17122	FE263006CDC76FC3	=	1056
17130	3E6F2A8C797EFE26	=	974
17138	D259703E0A32E270	=	871
17146	2A8C797EFE172005	=	791
17154	3E1032E270FE1520	=	773
17162	053E0232E270CDA1	=	823
17170	70213E407EFE2C28	=	735
17178	2CFE2E2823237EFE	=	839
17186	272822FE26281EFE	=	729
17194	25281AFE3226163A	=	527
17202	F57FFE00200F2AF3	=	959
17210	7F3E31773E0132F7	=	717
17218	7F2AF17FE92AF37F	=	1182
17226	3E29773E0232F77F	=	710
17234	2AF17FE9CD027B78	=	1093
17242	FE27C0117A6FC370	=	1042
17250	703E343A002D2638	=	426
17258	2A00322E38382A29	=	333
17266	0026003126272A31	=	255
17274	0026343700282631	=	277
17282	31CD047A78FE27C0	=	1129
17290	11A76FC370703E34	=	828
17298	3A002026382A0032	=	292
17306	2E38392A29002600	=	279
17314	3126272A31002634	=	312
17322	37002F3A38352A8C	=	493
17330	79233E0A32E270CD	=	821
17338	A1703AF57F32CF78	=	1083
17346	3E0032F57FCD787A	=	931
17354	21000022F57FC92A	=	682
17362	ED7FED4BE87F7CB8	=	1343
17370	DA597070E9CA5970	=	1132
17378	DA59702A8C79233E	=	867
17386	0A32E270CDA1703A	=	934
17394	F57F32CF783E0032	=	864
17402	F57FCD8C7A210000	=	824
17410	22F57F3E382AF37F	=	935
17418	773E0132F77F2AF1	=	859
17426	7FE93E0A32E27023	=	858
17434	E5237EFE0E20FA23	=	975
17442	22ED7F7EE1F5CDA1	=	1360
17450	703AF57F32CF783E	=	984
17458	0032F57FCD447AF1	=	1059
17466	C900000000000000	=	201

17474	CD047A78FE27CA6D	=	1055
17482	702AF37F79C61C77	=	990
17490	2AF17FE911817001	=	902
17498	3E00CD6B082AF87F	=	772
17506	220740CF08320040	=	434
17514	2E00282633390026	=	270
17522	38382A3227312A00	=	334
17530	34332A00342B0039	=	297
17538	2D2A002834292A18	=	289
17546	E521010022EA7FE1	=	883
17554	237EFE1C3806FE2C	=	803
17562	300218F42B7EFE1C	=	769
17570	3804FE2C3801C9E5	=	845
17578	D61CFE002813ED5B	=	883
17586	EA7F210000471910	=	505
17594	FDEB2AF57F1922F5	=	1206
17602	7FED5BEA7F210000	=	849
17610	060A1910FD22EA7F	=	705
17618	E118C93C1C1C1D27	=	634
17626	291D242A1E271C1E	=	275
17634	2F1C1F2F1C1D2F31	=	306
17642	151C1C3D28282A25	=	297
17650	271D2A241F271C1E	=	274
17658	301C1F301C1D3031	=	309
17666	181C1C20381C1D26	=	261
17674	291D232A1E261C1E	=	273
17682	2C1C1F2C1C1D2D31	=	300
17690	171C1C2F381C2A25	=	289
17698	261D2A231F261C1E	=	271
17706	2E1C1F2E1C1D2E31	=	303
17714	191C1C2F33381D25	=	301
17722	291D3C2E1E261C1E	=	292
17730	281C1F2B1C1D2B31	=	294
17738	181C1C2F34382A25	=	314
17746	281D2B3C1F2B1C1E	=	269
17754	3C1C1F2C1C1D2C31	=	297
17762	3F1C1C2F3B381D32	=	354
17770	291D332A1E321C1E	=	310
17778	221C1F221C1D2231	=	267
17786	1A1C1C2F30382A25	=	312
17794	321D2A3C1F321C1E	=	320
17802	2A1C1F2A1C1D2A31	=	291
17810	181C1C1C2F2F1C2F	=	282
17818	301D2F201D2F2E1D	=	320
17826	2F281D2F2C1D2F2E	=	320
17834	1D2F2A1D302F1D30	=	319
17842	301D302D1D302E1D	=	322
17850	302B1D302C1D3022	=	323
17858	1D302A1D2D2F1D2D	=	314
17866	301D2D2C1D2D2E1D	=	316
17874	2D2B1D2D2C1D2D22	=	314
17882	1D2D2A1D2E2F1D2E	=	313
17890	301D2E2C1D2E2E1D	=	318
17898	2E2B1D2E2C1D2E22	=	317
17906	1D2E2A1D2B2F1D2B	=	305
17914	301D2B2C1D2B2E1D	=	312
17922	2B2B1D2B2C1D2B22	=	308
17930	1D2B2A1D2C2F1D2C	=	307
17938	301D2C2C1D2C2E1D	=	314
17946	2C2B1D2C2C1D2C22	=	311
17954	1D2C2A1D222F1D22	=	288
17962	301D222C1D222E1D	=	294
17970	222B1D222C211C1C	=	273
17978	1D222A1D2A2F1D2A	=	294
17986	301D2A2C1D2A2E1D	=	310
17994	2A2B1D2A2C1D2A22	=	305
18002	1D2A2A2A2A2F2A2A	=	328
18010	302A2A2C2A2A2E2A	=	349
18018	2A2B2A2A2C2A2A22	=	331
18026	2A2A2A372A2F372A	=	367
18034	30372A2C372A2E37	=	388
18042	2A2B372A2C372A22	=	357
18050	372A2A352F1C3530	=	368
18058	1C352C1C352E1C35	=	334
18066	2B1C352C1C35221C	=	311
18074	352A1C342A2F342A	=	358
18082	30342A2C342A2E34	=	379
18090	2A2B342A2C342A22	=	351
18098	342A2A2B2F1C2B30	=	345
18106	1C2B2C1C2B2E1C2B	=	304
18114	2B1C2B2C1C2B221C	=	291
18122	2B2A1C382F1C3830	=	344
18130	1C382C1C382E1C38	=	337
18138	2B1C382C1C38221C	=	313
18146	382A1C302F1C3030	=	343
18154	1C302C1C302E1C30	=	319
18162	2B1C302C1C30221C	=	301
18170	302A1C202F1C2030	=	331
18178	1C202C1C202E1C20	=	310
18186	2B1C202C1C20221C	=	295
18194	202A1C33331C3127	=	333
18202	1C2E33292E291C2C	=	328
18210	332933271C2A2A31	=	342
18218	221C1C33341C331C	=	300
18226	1C2E34291C1E1C2C	=	297
18234	34292C291C372A31	=	352
18242	231C1C33381C3126	=	310
18250	1C2E38293A312A2C	=	361
18258	382938261C35311C	=	340
18266	241C1C33301C301C	=	305
18274	1C2E3029302A312C	=	355
18282	30291C1F1C342A31	=	319
18290	251C1C33371C3128	=	313
18298	1C2E37293D38282C	=	371
18306	372932251C28311C	=	331
18314	261C1C333D1C2E22	=	314
18322	1C2E3D293D25252C	=	356
18330	3D291C2A1C35311C	=	321
18338	271C1C33391C3128	=	330
18346	1C2E3929141C1C2C	=	292
18354	392932281C30311C	=	341
18362	281C1C333A1C1D32	=	312
18370	2B2E3A293E1C1C2C	=	344
18378	3A291C1F1C2C311C	=	302
18386	291C1C7600020003	=	245
18394	EA402F1C40301C40	=	573
18402	201C402E1C402B1C	=	346
18410	402C1C40221C402A	=	368
18418	1C412F1C41301C41	=	374
18426	201C412E1C412B1C	=	348
18434	412C1C41221C412A	=	371

18442	1C422F1C42301C42	=	377
18450	2D1C422E1C422B1C	=	350
18458	422C1C42221C422A	=	382
18466	1C432F1C43301C43	=	380
18474	2D1C432E1C432B1C	=	352
18482	432C1C43221C432A	=	377
18490	1C442F1C44301C44	=	383
18498	2D1C442E1C442B1C	=	354
18506	442C1C44221C442A	=	380
18514	1C452F1C45301C45	=	386
18522	2D1C452E1C452B1C	=	356
18530	452C1C45221C452A	=	383
18538	1C00000000000000	=	28
18546	0000000000000001	=	1
18554	0000000000000000	=	0
18562	00462F1C46301C46	=	361
18570	2D1C462E1C462B1C	=	359
18578	462C1C46221C462A	=	386
18586	1C473F2F473F3047	=	462
18594	3F2D473F2E473F2B	=	465
18602	473F2C473F22473F	=	480
18610	2A47402F47403047	=	478
18618	402D47402E47402B	=	468
18626	47402C4740224740	=	483
18634	2A47412F47413047	=	480
18642	412D47412E47412B	=	471
18650	47412C4741224741	=	486
18658	2A47422F47423047	=	482
18666	422D47422E47422B	=	474
18674	47422C4742224742	=	489
18682	2A47432F47433047	=	484
18690	432D47432E47432B	=	477
18698	47432C4743224743	=	492
18706	2A47442F47443047	=	486
18714	442D47442E47442B	=	480
18722	47442C4744224744	=	495
18730	2A47452F47453047	=	488
18738	452D47452E47452B	=	483
18746	47452C4745224745	=	498
18754	2A47462F47463047	=	490
18762	462D47462E47462B	=	486
18770	47462C4746224746	=	501
18778	2A483F2F483F3048	=	479
18786	3F2D483F2E483F2B	=	467
18794	483F2C483F22483F	=	483
18802	2A48402F48403048	=	481
18810	402D48402E48402B	=	470
18818	48402C4840224840	=	485
18826	2A48412F48413048	=	483
18834	412D48412E48412B	=	473
18842	48412C4841224841	=	489
18850	2A48422F48423048	=	485
18858	422D48422E48422B	=	476
18866	48422C4842224842	=	492
18874	2A48432F48433048	=	487
18882	432D48432E48432B	=	479
18890	48432C4843224843	=	495
18898	2A48442F48443048	=	489
18906	442D48442E48442B	=	482
18914	48442C4844224844	=	498
18922	2A48452F48453048	=	491
18930	452D48452E48452B	=	485
18938	48452C4845224845	=	501
18946	2A48462F48463048	=	493
18954	462D48462E48462B	=	488
18962	48462C4846224846	=	504
18970	2A493F2F493F3049	=	482
18978	3F2D493F2E493F2B	=	469
18986	493F2C493F22493F	=	486
18994	2A49402F49403049	=	484
19002	402D49402E49402B	=	472
19010	49402C4940224940	=	489
19018	2A49412F49413049	=	486
19026	412D49412E49412B	=	475
19034	49412C4941224941	=	492
19042	2A49422F49423049	=	488
19050	422D49422E49422B	=	478
19058	49422C4942224942	=	495
19066	2A49432F49433049	=	490
19074	432D49432E49432B	=	481
19082	49432C4943224943	=	498
19090	2A49442F49443049	=	492
19098	442D49442E49442B	=	484
19106	49442C4944224944	=	501
19114	2A49452F49453049	=	494
19122	452D49452E49452B	=	487
19130	49452C4945224945	=	504
19138	2A49462F49463049	=	496
19146	462D49462E49462B	=	490
19154	49462C4946224946	=	507
19162	2A7600004901EA03	=	533
19170	3126360B37372626	=	326
19178	0B37312A0B292A26	=	281
19186	0B37372A0B382A26	=	309
19194	0B2628290B292E0B	=	243
19202	312A290B3A280B29	=	290
19210	2A2B0B292F333F0B	=	306
19218	2C2B313B0B373839	=	317
19226	1C0B3734332A0B37	=	309
19234	3839102A0B373839	=	355
19242	1E2A0B373438391E	=	302
19250	0B373833201C0B37	=	305
19258	3839202A0B373839	=	360
19266	2122200B2A290B26	=	247
19274	33290B2A2B313108	=	290
19282	28350B2F350B2F37	=	317
19290	0B34370B35343508	=	298
19298	353A382C0B372A39	=	377
19306	0B3827200B382A27	=	310
19314	0B3034370B2A2926	=	309
19322	0B3827200B2E3308	=	285
19330	343A390B2A3D300B	=	353
19338	3334350B2A3D0B2A	=	323
19346	2E0B2F33310B3731	=	314
19354	2A0B373A2F0B3731	=	316
19362	0B37370B3831260B	=	266
19370	3837260B38373108	=	331
19378	272E390B372A3908	=	317
19386	302A39082E330B33	=	325
19394	2A2C0B372A39330B	=	313
19402	2E320B372A392E0B	=	318

19410	343A390B37372908	=	340
19418	3731290B31292E0B	=	303
19426	2B352E0B2E332E0B	=	304
19434	343A392E0B312929	=	355
19442	0B2B35290B2E3329	=	294
19450	0B343A39290B3129	=	320
19458	2E370B2B352E370B	=	317
19466	2E332E370B34392E	=	364
19474	370B312929370B2B	=	303
19482	3529370B2E332937	=	353
19490	0B343929370B7800	=	345
19498	0B7F00EA0000B810	=	399
19506	2227110B102E3011	=	247
19514	0B102A29110B102E	=	200
19522	3E110B102C31110B	=	228
19530	10292A110B102728	=	222
19538	110B2C310B292A0B	=	227
19546	27280B2B2B0B3333	=	284
19554	0B260B2D0B310B29	=	217
19562	0B2A0B270B280B33	=	216
19570	0B38300B333F0B3F	=	319
19578	0B33280B2B0B3534	=	269
19586	0B29300B350B3208	=	244
19594	10380B110B103333	=	271
19602	110B352A0B102811	=	207
19610	0B1C0B1D0B1E0B1F	=	162
19618	0B200B210B220B23	=	178
19626	0B76000CE000EA39	=	608
19634	3F3E3A3E2F342527	=	404
19642	1D3C274B1C1C4C1C	=	363
19650	1C403F1C1D472A39	=	395
19658	303E3A3E20372527	=	409
19666	1D273C481C1C1D48	=	363
19674	2A392D3E3A3E2D34	=	423
19682	25261D3C2B4D401C	=	371
19690	1D2A47392E3E3A3E	=	427
19698	2E3725261D263C4D	=	380
19706	411C1D2A4839283E	=	398
19714	3A3E2D3425251D3C	=	378
19722	25501C1C392C3E3A	=	394
19730	3E2C3725251D263C	=	362
19738	511C1C3428321D3C	=	365
19746	3E392A3E3A3E2A37	=	428
19754	25321D323C521C1C	=	364
19762	531C1C541C1C551C	=	398
19770	1C561C1C571C1C58	=	401
19778	1C1C591C1C5A1C1C	=	347
19786	5B1C1C5C1C1C5D1C	=	416
19794	1C5E1C1C5F1C1C60	=	425
19802	1C1C611C1C76000D	=	340
19810	3300EA11EC70213E	=	745
19818	403E00323C400603	=	309
19826	0E001A8E20010C23	=	310
19834	1310F779FE032005	=	697
19842	3A3C404FC9282028	=	591
19850	3A3C403CFE00200B	=	747
19858	010F27C076000E3F	=	451
19866	00EA11F8763E0132	=	730
19874	3C4021F14F3A7940	=	720
19882	471AFE0828138E20	=	643
19890	10231310F41AFE08	=	621
19898	20073A3C4006004F	=	306
19906	C91AFE0828031318	=	578
19914	F8133A3C403CFE4E	=	841
19922	20CD00010F27C976	=	611
19930	000F3A002A3EF832	=	667
19938	E4793E7632B579CD	=	1038
19946	B379C93E4532B479	=	983
19954	3E7532B579CD8379	=	1039
19962	C93EEC3270793E70	=	969
19970	327E79CD7C79C93E	=	1010
19978	F23270793E73327E	=	891
19986	79CD7C79C9760010	=	906
19994	3A01EACDE70221D4	=	976
20002	7B22D07B2B36002B	=	628
20010	3600C92AD07B3666	=	784
20018	233ACF7B4F7123ED	=	887
20026	5BFE7F7323722322	=	805
20034	D07BC92AD07B3664	=	1059
20042	233ACF7B4F7123ED	=	887
20050	5BFE7F7323722322	=	805
20058	D07B21D07B34C92A	=	992
20066	D07B3665233ACF7B	=	909
20074	4F7123ED5BFE7F73	=	1051
20082	23722322D07B21D3	=	793
20090	7B34C911D47B3AD2	=	996
20098	7BFE00C83D32D27B	=	1021
20106	1AFE642814131313	=	497
20114	133AD17BBA20F13A	=	926
20122	D07BBB20E6010F27	=	840
20130	C9EBB2CC7B11D47B	=	1149
20138	1AFE662814131313	=	499
20146	133AD17BBA20F13A	=	925
20154	D07BBB20E6010F27	=	840
20162	C923131ABE20052A	=	558
20170	CC7B18E22313E51A	=	886
20178	4F131A47EB1A6F13	=	586
20186	1A67545C3FED423E	=	734
20194	FD951312D1131318	=	710
20202	9511D47B3AD378FE	=	1147
20210	00C83D32D3781AFE	=	925
20218	852814131313133A	=	295
20226	D17BBA20F13AD07B	=	1130
20234	BB20E6010F27C9EB	=	945
20242	22CC7B11D47B1AFE	=	993
20250	662814131313133A	=	296
20258	D17BBA20F13AD07B	=	1180
20266	BB20E6010F27C923	=	745
20274	131ABE20052ACC7B	=	649
20282	18E22313E51A4F13	=	657
20290	1A47EB1A6F131A67	=	617
20298	23797763787D0113	=	777
20306	2318990000113C00	=	273
20314	EA40414243444546	=	703
20322	4748494A4B4C4F50	=	601
20330	515253545558595A	=	685
20338	5B5E5F6061626367	=	773
20346	68696A6B6E727378	=	874
20354	797A7BA0A1A2A3A6	=	1130
20362	A9AAABB0B1B2B3B8	=	1404
20370	B9BABB7600000000	=	676

(continued from previous page)

30 Rem LD BC. LO — here, BC is loaded with the 16-bit address of where label 0 would be when the mnemonics are assembled.
or:
20 Rem: LO:SET 7.A;XOR A etc . . .
30 Rem Call LO — the address is automatically done when assembled. In all the examples I've used decimal numbers, but I could easily use hex or even binary numbers. To enter a hex number, you must put an asterisk before it like so:

LD A.*2A, or LD DE.*B2CA

For a binary number, you put a plus sign before it like so:
LD, HL, + 0110101010000101, or
LD C. + 10100011

One of the special features of this assembler, is that you can have messages imbedded in your code. These can also be labelled and are put betweeen quotes. Here is an example:
1 Rem . . .
10 Rem (
20 Rem "THIS IS A MESSAGE"
and label the same like so:
1 Rem . . .
10 Rem (
20 Rem:LS:"THIS IS A MESSAGE"
30 Rem LD HL.LS;LD BC. etc.

To have reminders and comments in your mnemonics, so you know which part does what, you use an asterisk. This is put before the reminder.
Like so:
1 Rem . . .
10 Rem (
20 Rem *THIS IS A COMMENT
30 Rem LD HL 2A0K; etc
40 Rem * THIS IS etc and so on.

Now when you've finished your mnemonics, you enter a Rem) close brackets. This has to be at a line, at the end of your mnemonics. This is so the assembler knows when the end of assembling has been reached. Then you type in this short program to run the assembler:
9990 LET ADD = 16514
9991 POKE 32767, INT (ADD/256)
9992 POKE 32766, ADD — 256*INT (ADD/256)
9993 LET A = USR 27819

The value of Add doesn't have to be 16514, but can be any address where memory is reserved for the code, except 27819 or upwards as this holds the assembler and the label stack. Both address 32766 and 32767 will hold the address of the place the assembler should dump to.

Now for the moment of truth. Type Run. You should see the screen flicker and at the top of the screen:

LOOP ACCOMPLISHED

should have been written. This means that if you now List the program, you will see at line number 1 the compiled machine code, and all is well.

However, if the computer prints:
I CAN'T ASSEMBLE ONE OF THE CODES
then it means that you've made an error with one of the mnemonics. To help you find the error the computer displays at the bottom of the screen a 9 followed by a / sign. After this is the number logo where the mistake occured so:

9/5

would mean a mistake has happened at loop 5.

If the computer prints:
YOU HAVE MISSED A LABEL USING JUMP
it simply means that you have in the mnemonics requested a label using JR, DJNZ etc when this label doesn't exist.
YOU HAVE MISSED A LABEL USING CALL
would mean that you've requested a non-existent label, maybe using CALL L92, LD HL. L12 etc.

There must only be one space between the command and the next number or register in the mnemonics. For example LD (65535). A is acceptable, while LD (65635). A is not. You use a full stop or a space to separate each section. For example, LD A.B. is good, as is LD A B. All RST should have their numbers in decimal and have the numbers close to the letters like: RST48. All label numbers should be in decimal, and there should be no space at the end of the line. ■

Example program 1.

```
   1 REM ........................
.................................
.................................
........
   5 REM EXAMPLE1
  10 REM (
  20 REM * RANDOM PLOT *
  25 REM *(THIS MUST BE LOADED
 WITH ASSEMBLER ABOVE RAMTOP.)
  30 REM *READY TO BE ASSEMBLED
 WITH SUPER "SEMBLER AT ADDRESS
16514.
  40 REM *BREAK M/C WITH SHIFT.
  50 REM JR L1
  60 REM :L0:*RAND;LD HL.(16434)
  70 REM LD DE.(16435);ADD HL.DE
  80 REM LD DE.(16436);ADD HL.DE
;LD (16434).HL;LD A.L;RET
  90 REM :L1:CALL L0;AND 63
 100 REM LD C.A
 110 REM :L2:CALL L0;AND 63
 120 REM CP 44;JR NC L2;LD B.A
 130 REM CALL 2994
 140 REM LD A.(16422);CP 254;RET
 Z;JR L1
 150 REM )
9990 LET ADD=16514
9991 POKE 32767,INT (ADD/256)
9992 POKE 32766,ADD-256*INT (ADD
/256)
9993 LET A=USR 27819
```

Example program 2.

```
   1 REM ........................
.................................
.................................
........
   5 REM EXAMPLE2
  10 REM (
  20 REM *PRINT ROUTINE*
  25 REM *(THIS MUST BE LOADED
 WITH ASSEMBLER ABOVE RAMTOP.)
  30 REM *READY TO BE ASSEMBLED
 WITH SUPER "SEMBLER AT ADDRESS
16514.
  40 REM LD B.52;:L0:PUSH BC
  50 REM LD DE.L2;PUSH DE
  60 REM LD B.14;:L1:LD A.(DE);A
DD A.128;LD (DE).A
  70 REM INC DE;DJNZ L1
  80 REM POP DE;LD BC.14
  90 REM CALL 2923
 100 REM POP BC;DJNZ L0;RET
 110 REM :L2:"YOUR COMPUTER,"
 120 REM )
9990 LET ADD=16514
9991 POKE 32767,INT (ADD/256)
9992 POKE 32766,ADD-256*INT (ADD
/256)
9993 LET A=USR 27819
```

Example program 3.

```
   1 REM ........................
.................................
.................................
........
   5 REM EXAMPLE3
  10 REM (
  20 REM *CHARACER SET*
  25 REM *(THIS MUST BE LOADED
 WITH ASSEMBLER ABOVE RAMTOP.)
  30 REM *READY TO BE ASSEMBLED
 WITH SUPER "SEMBLER AT ADDRESS
16514.
  40 REM LD C.127;:L0:PUSH BC
  50 REM LD DE.(16396);LD C.24
  60 REM :L1:LD B.32;:L2:INC DE;
LD A.(DE);INC A
  70 REM BIT 6.A;JR Z L3;RES 6.A
;SET 7.A
  80 REM :L3:LD (DE).A;DJNZ L2
  90 REM INC DE;DEC C;JR NZ L1
 100 REM LD DE.650;:L4:DEC DE;LD
 A.D;CP 255;JR NZ L4
 110 REM POP BC;DEC C;JR NZ L0
 120 REM RET
 130 REM )
9990 LET ADD=16514
9991 POKE 32767,INT (ADD/256)
9992 POKE 32766,ADD-256*INT (ADD
/256)
9993 LET A=USR 27819
```

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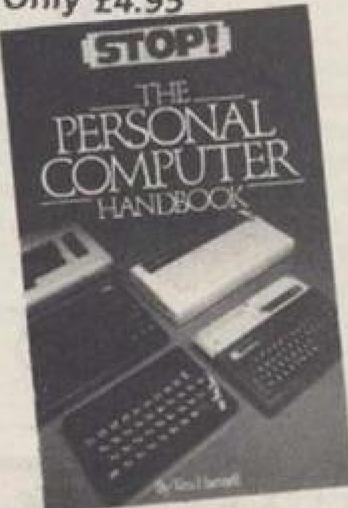
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Although Spectrum interrupts can be harnessed quite readily — at least on the 48K machine — from machine code, the Basic programmer is left out in the cold with no commands to support interrupt-driven programming. Presented here is a program which rectifies this shortcoming by equipping Spectrum Basic with a number of interrupt commands, as well as the On Error and On Break commands found in Microsoft Basic. Due to the problems associated in accessing interrupts, even from machine code, on a 16K machine, it will only operate on the larger model.

The machine code resides above RAMtop, occupying addresses 63866 to 65367. Type in listing 1 and Run it. The program automatically lowers RAMtop and proceeds to Poke the code into memory. Each of the 23 data lines holding the code in a hexadecimal form has an associated checksum. If at any time the code in a line doesn't tally with its checksum then the computer stops, displaying the line at which the discrepancy was found.

When the code is in a form that the computer will readily accept — i.e., correct — you can save the code using the command below. Don't worry about the long delay while the computer Pokes the code; it takes a couple of minutes and don't be concerned by the blank screen, the computer hasn't crashed — hopefully.

```
SAVE "MULTI-TASK"CODE 63866,1413
```

You can reload at any time with:

```
CLEAR 63000: LOAD ""CODE
```

The 10 new Basic commands provided by the program can be accessed by typing them in in Rem statements. There's a limit of one command per Rem and, as usual, a Rem statement must be the last item on a line. To make the computer treat Rems in this new fashion it is necessary to initialise the machine code by using a Randomise USR 63866 as the first line of your program. Subsequently, Rems will be treated in the new manner with no further need for USR calls. The full command list is as follows:

AFTER	ON ERROR GOTO
EVERY	ON BREAK STOP
DISABLE	ON BREAK GOSUB
ENABLE	IGNORE BREAK
DROP	RESUME

I'll now deal with each of the commands individually. The simplest command is Ignore Break. As you would expect this command forces a program to ignore the break key and therefore prevents you from breaking into it. As an example, type in the following short program, but only if there's nothing important in memory.

```
10 RANDOMIZE USR 63866
20 REM IGNORE BREAK
30 GOTO 30
```

Pulling out the plug is the only way out of this program. The command in line 20 is typed in letter by letter, a little more laborious than single key entry but certainly a lot less confusing. You can type in either upper or lower case but upper case tends to look a bit neater. If the first character of a Rem is an asterisk then the rest of the line is ignored. In this way you are still able to add comments to a program.

The next command, On Break Stop restores normality to the break key:

(continued on next page)

Listing 1.

```
  10 REM       MULTITASKING
  20 REM     BASIC EXTENSION
  30 REM
  40 REM     By Richard Taylor
  50 REM
  60 CLEAR 63000
  70 LET a=63866
  80 FOR l=0 TO 22
  90 LET t=0: READ v,a$
 100 IF LEN a$/2<>INT (LEN a$/2)
 THEN GO TO 500
 110 FOR c=1 TO LEN a$ STEP 2
 120 LET x=CODE a$(c)-48-7*(a$(c
)>="A")
 130 LET y=CODE a$(c+1)-48-7*(a$
(c+1)>="A")
 140 POKE a,16*x+y
 150 LET t=t+16*x+y
 160 LET a=a+1
 170 NEXT c
 180 IF v<>t THEN GO TO 500
 190 NEXT l
 200 PRINT "Data OK - Now SAVE"
 210 STOP
 500 PRINT "ERROR in line ";8000
+l*10
 510 STOP
8000 DATA 7666,"C321FDC31AFDC321
FBDFCD882C3020CD8D2C3808CD3B2DCD
991EDFC9237EFE0D280FFE2C280BFE21
38F2CD882C38EDCF0BCDB2283906230D
B43318DBCF01DF1A"
8010 DATA 8003,"E67F4F7E23FE2038
FAF620B9200A1A131730EC225D5C37C9
1A131730FBB7C9E1867465F29DFC6576
6572F9A2FC64697361626CE5E2FB656E
61626CE51CFC7265"
8020 DATA 7572,"73756DE54CFC6F6E
206572726F7220676F74EF7FFC6F6E20
627265616B20737460FF05EFA6F6E2062
72656168206760F7375E272FA69676E6F
726520627265561EE"
8030 DATA 3865,"6DFA64726FF0E5FE
00676F7375E21109F9CD88F938081313
1AA720F5CF0BEB5E2356EBE92100FF22
08FFFDCB7656C0220DFFC92100FE18EF
CD83F9FE0DC2A9F9"
8040 DATA 9248,"696011102787ED52
19380CCF0AE7CD8F16FD340DDF0600FE
0D282EFE3A28EE21B5FAE54FE779FEEA
2858FEFA2862FEFECA56FDFEE8CAD0FD
C3441BCD0AFEDFFE"
8050 DATA 6408,"0D2806FE3A28C6CF
0B2A555C3EC0A62802CFFFAFFE01CE00
56235EED53455C235E2356EB19232255
5CEB225D5C571E00FD360AFF15FD720D
289314CD8B1928BE"
8060 DATA 8461,"CF16DFFE2A2003E1
188FFE0DC8C348FACD821CDFFECBC28A
1CC1EF0238EBCDE934DAC3FAC387FA2A
```

(listing continued on next page)

(continued from previous page)

```
10 RANDOMIZE USR 63866
20 REM *Press 'a' to get out of this
30 REM IGNORE BREAK
40 IF INKEY$ = "a" THEN REM ON BREAK
   STOP
50 GO TO 40
```

The last of the three commands concerned with the operation of the break key is On Break Gosub. This is a much more powerful command than the previous two; allowing a full-blooded subroutine to be called when break is pressed. In order to specify which line should be jumped to this command must be followed by a valid line number. You have two options over this, you can either put a number in directly or the name of a variable. What you're not allowed to do is have a mathematical expression, so something like 10+1000 is invalid but 1010 is OK.

The complexity of the break subroutine will obviously depend on the application it is being used for. In many cases it would simply consist of a Run command to restart the program completely if break is pressed. In any case, the operation of the routine is entirely up to you. A break subroutine is written in exactly the same manner as a normal subroutine; terminated with a Return command.

In order to prevent break subroutines nesting themselves by the user pressing break while the break-handling routine is actually running, the key is ignored while the routine is in progress; just as though you'd used Ignore Break. When the terminating Return is reached the original status of break handling is restored. It is possible to redefine the operation of the break key from within the Break handler itself, although its effect won't be initialised until the break routine has finished. The following short example will call the break handler at line 1000 only the first time break is pressed.

```
  10 RANDOMISE USR 63866
  20 REM ON BREAK GOSUB 1000
  30 GO TO 30
1000 PRINT "You've pressed break"
1010 REM ON BREAK STOP
1020 IF INKEY$ = " " THEN GO TO 1020:
     REM *Wait if user still pressing break
1030 RETURN
```

When you write a break handler it is important not to use any variables utilised in the main program as altering them might upset the program when it is Returned to. It's not really a good idea to print on the screen either as your printing might corrupt the layout of the program's own output or even, in some circumstances, cause it to halt with an error.

If your program is menu-driven then it is a good idea to terminate the break routine with a jump to the part of the program which prints the menu. If a user selects the wrong option at the menu then pressing break will immediately return control to the menu without harm.

Disabling the break key might not completely protect a program as there are other places where you may be able to stop it. Namely when the computer asks "scroll?", during any printer/cassette/Microdrive access or by typing Stop in response to an input prompt. However, you can intercept these possibilities by detecting the error reports that they cause using the On Error Goto n command where n is a line number.

This command allows you to trap any sort of error that occurs in a program. When an error is detected the computer does a Go To to the given line — not a Gosub although the computer does remember where the error occurred. The error handling routine should be able to competently handle any error that can occur in a program. In common with break subroutines, error routines may just consist of a Run command to restart the program if an error appears.

Some Basics automatically list the line at which an error occurred to give you the opportunity of modifying it if, indeed, it is where the mistake lies. Using the On Error command it is possible to add this facility to ZX Basic. It is necessary to know the line at which the error was found. To be able to do this you need to insert a Def FN command in the first line of the program along with the USR call:

```
10 DEF FN v(a) = USR 63872: RANDOMIZE
   USR 63866
```

Inside the error routine, FN v(8) returns the line at which the error occurred. The self-listing routine is as follows, you might find it a very time saving debugging aid:

```
  10 DEF FN v(a) = USR 63872: RANDOMIZE
     USR 63866
  20 REM ON ERROR GOTO 9990
     <Rest of program>
9990 PRINT "Error ";CHR$ FN v(10);" at line
     ";FN v(8); ":";FN v(9)
9991 PRINT
9992 LIST FN v(8)
```

FN v(9) returns the statement number of the erroneous command and CHR$ FN v(10) returns the alphanumeric code for the error.

The Resume command can be used optional at the end of an error-handling routine to continue execution of a program from the statement where the error was detected. If you follow Resume by a line number then execution continues from that line instead of from the point of the error. You should always terminate error handlers with a Resume if you intend to re-enter the program, never use a Go To. To prevent error handlers from becoming nested, any errors detected within the error routine itself are reported in the usual manner. The following program repeats forever — or at least until you answer no to the "scroll?" prompt. It illustrates the danger of resuming from the point of the error without actually correcting the error's cause.

```
  10 DEF FN v(a) = USR 63872: RANDOMIZE
     USR 63866
  20 REM ON ERROR GOTO 1000
  30 LET a = b: REM *What b?
1000 PRINT "Oh dear, there's been an error"
1010 REM RESUME
```

The use of Verify or Load commands from within a program often causes problems if there is a tape error since you are left in command mode once the error has been reported. If the program is going to be used by people other than its author, then it is necessary to print instructions on the screen of what to do in the event of a tape error to re-enter the program. This works, but is hardly state of the art in user-friendliness.

The On Error command provides a useful solution to this problem by allowing an error handler to be called if a tape error is detected which can invite the user to try again. There are many instances in a program where it is useful to use an On Error command, most notably when checking the validity of user input. Rather than undergoing complicated checking routines it is much easier to assume that it is right but set up an error routine as a safety net while the input is being processed so that any errors caused by invalid data can be solved by looping back to the input statement to ask the user for the input again.

The major function of the program is of course to provide interrupt handling. This is implemented in the form of the commands: After, Every, Disable, Enable and Drop. The scheme of things is basically this; there is a timer available counting at a rate of 50 units per second — the Frames rate. Using the After command you can set the timer to a specific value. Immediately, the timer starts counting down towards zero. Your program can happily continue, not having to worry about the timer any further. When the counter reaches zero the flow of your main program is temporarily diverted to a certain subroutine; just as if a

(contined on page 150)

(listing continued from previous page)

```
0B5C2323CD8433CD941EFE0B3802CF0A
FE0830194F878787"
8070 DATA 7455,"916F2600110FFF19
F34E2346FB23CB46C8010000C9FE0930
05ED4B03FFC9FE0A30073A02FF4F0600
C93A01FFC631FE3A38F3C60718EFFFF5
C5D5E5FDCB764620"
8080 DATA 7153,"2D0608210FFFE55E
235623CB46200E7AB3280A1B2B722B73
7AB3CCADFB110700E11910E2FDCB007E
2004FDCB76C6E1D1C1F1C92323E5235E
2356D52A09FFED5B"
8090 DATA 7445,"07FF87ED52110F00
ED52D1380A2A09FF722B732B2209FFE1
CB4EC8E52323235E2356E12B722B7309
DFFE0D281DCD12FCFE08302C4F7BFE0D
C2A9F97987878791"
8100 DATA 7583,"6F26001111FF19CB
C8C906082111FF110700CBC61910FBC9
CD83F95F78A779C8CF0ADFFE0D281DCD
12FCFE0830F24F7BFE0DC2A9F9798787
87916F26001111FF"
8110 DATA 7631,"19CB86C906082111
FF110700CB861910FBC9FDCB764E2002
CF06DFFE0D2813CD83F9FE0DC2A9F921
0F27B7ED423881AF1807ED4B03FF3A02
FFFDCB768EED4342"
8120 DATA 7617,"5C32445CC9CD83F9
FE0DC2A9F9210F27B7ED42388BED4305
FF1138FD2A3D5C732372C9DD2E001803
DD2E02CD83F9FE2C2802CF0BE7C51143
FACD88F93E003819"
8130 DATA 9570,"CD12FCFE08D21AFC
F578FE2CC2A9F9E71143FACD88F930DA
F1F5CD83F9FE0DC2A9F9210F27B7ED42
DA1AFCF15F878787936F2600110FFF19
E56960CD8E19EBE1"
8140 DATA 7095,"360023360023DD7D
CB8EB6772373237223D17323722B2B2B
2B2BF3722B73FBC9ED7B3D5CC3B8FAFD
3676002170FB22FFFE210FFF1110FF01
37003600EDB03EFE"
8150 DATA 7930,"ED47ED5E2AB25C23
2207FF2179F92209FF2100FF220BFF22
0DFF18C4ED7B3D5CDDE1D17AFE3E2005
D5DDE5CF06CB7A20123BF1DDE5ED733D
5CED53425C32445C"
8160 DATA 8105,"C3B5FACBBAFDCB76
962A05FF220DFF18E0FDCB764EC20313
3A3A5C3201FFFD3600FFFDCB768EFDCB
76CE210000FD7537225F5C220B5CCDB0
16218BFDE52A455C"
8170 DATA 7983,"2203FF3A475C3202
FF2A05FF22425CFD360A00C3B5FAED5B
07FF2AB25C2387ED522002CF06EBCD05
FEED53885CCD05FEED53845CCD05FEED
537D5CCD05FEED53"
8180 DATA 7282,"425C2B7E32445C22
07FFC92B562B5EC9FDCB765620402A0D
FF7CFEFE2845FEFF2007CD541F383CCF
14CD541F3835ED7B3D5CDDE1ED5B455C
3A475C3CFDCB0A7E"
8190 DATA 8617,"2007ED5B425C3A44
5CF533CBFAD5DDE5ED733D5C22425CFD
360A00FDCB76D621B8FAE52179F987F3
ED5B09FFED52285AEB235E23562209FF
FEED4B07FFB7ED42"
8200 DATA 8017,"C5010F00ED42C138
41ED7B3D5C6960ED4B455C3A475C3CFD
CB0A7E2007ED4B425C3A445C77CD8FFE
ED4B7D5CCD8FFEED4B845CCD8FFEED4B
385CCD8FFE232207"
8210 DATA 8452,"FFEBC3C6FA237123
70C9FBFDCB0A7EC02A425CCD6E193A44
5C280CA7C2EC18477EE6C078C2B01EC1
C3CEFA2AB25CED5B07FF2387ED522002
CF0DEB110900B7ED"
8220 DATA 579,"522207FFC9"
```

(continued from page 148)
Gosub had been magically inserted in the right position in the program.

The subroutine is not terminated by a Return command but by the normally innocuous Continue. The syntax of the After command is After x, Gosub y. The Gosub has to be typed out in full. It is necessary, I'm afraid, to type in the seemingly redundant comma just before the Gosub bit.

The ability for a program to be freely interrupted in this way is often loosely termed Multitasking or parallel processing.

Here's a silly example — a listing for a computerised egg timer.

```
  10 RANDOMIZE USR 63866
  20 REM AFTER 9000,GOSUB 1000
  30 PRINT "Start boiling the egg. I'll just
     brush up on my mental arithmetic."
  40 LET a=INT (RND*1000)
  50 LET b=INT (RND*1000)
  60 PRINT a;" + ";b;" = ";a+b
  70 FOR c=1 TO 100: NEXT c
  80 POKE 23692,255: REM *Allow
     automatic scrolling
  90 GO TO 40
1000 PRINT "The egg is done"
1010 STOP
```

Line 20 sets up the time delay of 9000 1/50ths of a second — three minutes. Lines 30 to 90 just waste type by doing something completely unrelated with eggs, adding numbers together. Lines 1000 and 1010 are the subroutine called when the three minutes are up. The After command is a "single shot" command in that the subroutine is called only once, after which the timer becomes inactive. In most applications you would want a certain routine to be called at regular intervals. You could do this with the After command if you re-initialised the timer with After at the start of the subroutine.

However, a much better way is to use the Every command. Every is used in exactly the same manner as the After command. When the "interrupt service routine" — the subroutine called when the timer reaches zero — is reached the timer is automatically re-armed to its starting value ready for the next time. This program will constantly update the time at the top left-hand side of the screen even while another program is running:

```
  10 RANDOMIZE USR 63866
  20 LET min=0: LET sec=0
  30 REM EVERY 50,GOSUB 9900
  40 LET a=0
  50 PRINT AT 21,0;a: LET a=a+1
  60 GO TO 50
9900 LET sec=sec+1
9910 IF sec>59 THEN LET min=min+1:
     LET sec=0
9920 PRINT AT 0,0;("0" AND min<10);min;
     ":";("0" AND sec<10);sec
9930 CONTINUE
```

The delay time in an After or Every command can be up to 65,535 units, about 21 minutes 51 seconds. If you need longer delays than this for some reason then you could use the following method. For instance a delay of one hour could be produced by setting up an interrupt service routine — or ISR if you like abbreviations — called every 10 minutes. At the start of the program you would initialise a variable — a, say — to zero.

Each time the ISR is called the value in a is incremented and when it reaches six, an hour has passed. Bear in mind, however, that the Spectrum's clock isn't very accurate and you could end up with a quite drastic error with such a long delay.

So far I've talked about the "timer" in a singular sense. There are, in fact, eight timers. All eight are completely independent of one another in all respects. You can direct information to specific timers in an Every or After command by tapping another number in after the delay time, e.g.,

```
AFTER 100,7,GOSUB 9000
```

uses timer 7.

The timers are numbered 0 to 7. If you miss the timer number out, as in previous examples, then it defaults to timer 0.

The Disable command enables — no pun intended — you to suspend the operation of one or all of the timers. Disable used on its own disables all eight timers whereas Disable followed by a number disables only that particular timer. The inverse command is Enable which is used in a similar fashion to re-enable previously disabled timers.

```
  10 RANDOMIZE USR 63866
  20 REM AFTER 100,GOSUB 1000
  30 REM DISABLE 0
  40 GO TO 40
1000 PRINT "Time up!"
1010 STOP
```

Does nothing unless you remove the disable statement at line 30 or put in an enable command at line 35. You'd usually use the Disable/Enable commands to protect certain parts of a program from being interrupted, possibly because that part manipulates variables used by the ISR(s) and could leave the variables in temporary states that may upset the ISR(s).

The last command connected with interrupts is Drop. In an analogous way to normal Gosubs, before an ISR is called the current line and statement numbers are stored away on a stack so that normal program execution can continue quite happily when the ISR is finished. In some circumstances, however, you might not want to ever return from the ISR. For example, in a game you might wish to set a time limit to complete a certain task, say 10 seconds. You could use After 500, Gosub 8000 so that when the time is up a jump to line 8000 will be made. Obviously you wouldn't want to return from the ISR to continue that particular part of the game.

To save leaving the stack in an unbalanced state you would use the Drop command. This command simply makes the computer take the top item of its stack and throw it in its electronic dustbin. In an application such as this you can disarm the timer with an After 0, Gosub x as soon as the task's been completed otherwise you could find the computer calling the ISR at a rather inappropriate time.

When a timer counts down to zero the computer remembers that a certain line is to be called by placing its line number on yet another stack. When the statement currently being executed is finished it looks at the number it remembered and calls the appropriate ISR. Because ISR calls are not processed until the current statement is completed Input, Pause, Load, Save, Merge and Beep may hold things up. The computer, being a meticulous beast by nature, carefully piles up all the numbers of the ISR's it's got to call in preparation for such a time when it is able to process them.

Eventually the computer will run out of room and will no longer bother to store the lines. The amount of room the computer has got for stack storage is determined by how much memory you leave free between RAMtop and the start of the program at 63866. A good value for RAMtop is 63000 which leaves room for all but the most complex applications. Using the user-defined function introduced under the On Error command it is possible to interrogate any of the timers and find their current status. Use FN v(x) where x is the timer you wish to look at, numbered 0 to 7.

```
  10 DEF FN v(a)=USR 63872:
     RANDOMIZE USR 63866
  20 REM AFTER 1000,5,GOSUB 4000
  30 PRINT AT 0,0;FN v(5);" "
  40 GO TO 30
1000 STOP
```

The program displays the time remaining on timer 5 as it plunges towards zero. The function will return a zero if the timer is either inactive or disabled.

Unlike error and break handler routines, ISRs will nest to as many levels as you like although in practice the number of levels is determined by the amount of free memory available above RAMtop for the stack. One thing to avoid is to define an Every command with a time interval smaller than the time needed to execute the associated ISR. The routine will "interrupt itself" in such a circumstance as the next interrupt will have occurred before the ISR to handle the previous interrupt is finished.

Eventually the computer will get clogged up with an enormous stack of return lines which it never quite gets round to using. If this sort of situation is a possibility in your program then disable the timer right at the start of the ISR and enable it again right at the end. When writing ISRs, as with break and error handlers, it is important to remember that the routine should not do anything to unduly upset the main program by changing the value of one of the variables it is using, for instance.

The computer looks after you a bit by automatically storing the print and plot positions at the start of the ISR and restoring them to those values when the ISR is terminated. Print and plot positions are therefore "local" to the ISR. If you print and draw from within an ISR then the computer will automatically tidy any damage you might have done by changing the print/plot position.

There are a couple of points of interest to Interface 1 users. First, you should not use Open # and Close # commands in conjunction with this program. More precisely, programs using the interrupt facilities; On Error and On Break etc., don't matter. Secondly, any other Microdrive/Interface 1 commands should be immediately followed by

```
RANDOMIZE USR 63869: POKE 23728,0
```

sequences.

Rem statements typed in as direct commands are treated in the normal way and cannot, therefore, contain any new commands. The Continue statement cannot be used in the normal way as when an error is actually reported (in contrast to an error handler being called) then all the new stacks are cleared and the timers are all forced inactive. Continue will not, then, resume a program without actually clearing or changing anything. ■

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BBC RETRO-FITS

Acorn's new ABC lets you upgrade all the way to a minicomputer — you can't go that far with the BBC but John Dawson tries some packages which take it into the supermicro league.

THE PRODUCTION of massive quantities of add-on or "retro-fit" equipment for the BBC Microcomputer must be having some effect on the unemployment situation in the U.K. For those of you with some money to spend, or the hope that someone else will spend it for you, here is a pre-Christmas selection of hardware and software for the BBC computer. Prices range from less than £15 up to rather more than £120.

It's actually quite difficult to keep up with all the gadgets and programs that are being developed and advertised for the BBC machine. In the course of writing this article I have found a second and third ROM extension cable mentioned in advertisments, several more ROM extension boards, two or three more versions of Forth and so on.

No frustration or disgust

Only a few of the items in this review create any new capabilities for the BBC Micro; you can, after all, save programs on to tape, exchange Eproms using the four sockets in the ordinary machine and process words using any one of a number of programs. What the devices and software discussed here do achieve is an increase in your productivity by saving time, reducing fatigue and errors and encouraging you to concentrate on the task rather than the machine. The gain is so great in some cases that a job becomes possible where before you would have given up in frustration or disgust.

Multi-Forth 83 from Skywave has been written by David Husband who produced an earlier version of the language for the ZX-81. It is impossible to thoroughly test a piece of software like multi-Forth 83 in the course of a couple of weeks. That applies also to both the other chips — Ade and View A2.1 — discussed in this review. It *is* possible to give you some idea of the capabilities of the program and its underlying ideas and any gross faults.

Multi-Forth 83 comes as a 27128 16K Eprom and Skywave says that while it normally operates a return of post service, the worldwide shortage of these chips means that their initial stock is unlikely to last for very long while the price of £40 may have to change to reflect the Eprom supply situation.

A 176-page manual completes the standard package and a demonstration disc holding one program is available to round off a "de luxe" system. The manual contains a comprehensive description of the multi-Forth 83 system although you will need a separate Forth textbook if you are not familiar with the language.

Forth is a Threaded Interpretive Language and it is an intrinsic quality of TILs that they run quickly. Multi-Forth 83 is said to operate 17 times faster than BBC Basic — when it is performing one task. That seems a reasonable claim, particularly when you see the system multi-tasking and still operating quickly.

Normal programs execute a series of program instructions and stop. Multi-tasking allows you to place several complete programs into the computer's memory and the computer is then directed to hop around from one program to another so fast that it looks as though all the programs are running simultaneously.

Multi-Forth 83 will run up to 28 tasks at one time! The demonstration disc shows five tasks operating at once and the screen output is very impressive. If you start a foreground task it is noticeable that some of the others slow down, the screen display of the clock, for example, may only be updated every two seconds, but the overall performance of multi-Forth 83 is stunning.

You can print a listing of a program at the same time that you are doing something with the keyboard, sending commands to a robot via the user port and reading the position of a joystick.

The Forth position

The 1983 standard Forth definition has a lot of useful words in addition to those in the earlier 1979 standard and David Husband has included many BBC-specific commands from the operating system. Words are available also to control Sound, Envelope, Colour and Time. The editor allows the use of the BBC cursor keys as well as the usual single-key Forth commands.

Standard Forth uses integer numbers and multi-Forth 83 keeps to this policy offering 16-bit and 32-bit number-handling words. You can, of course, write your own floating-point words but the integer and fixed-point words in multi-Forth 83 will do very well for most applications.

Multi-Forth 83 will appeal greatly to anyone who is already familiar with the use of Forth; additionally, it should be considered by owners of the BBC computer who wish to start learning about Forth. Multi-Forth 83 does not

(continued on page 157)

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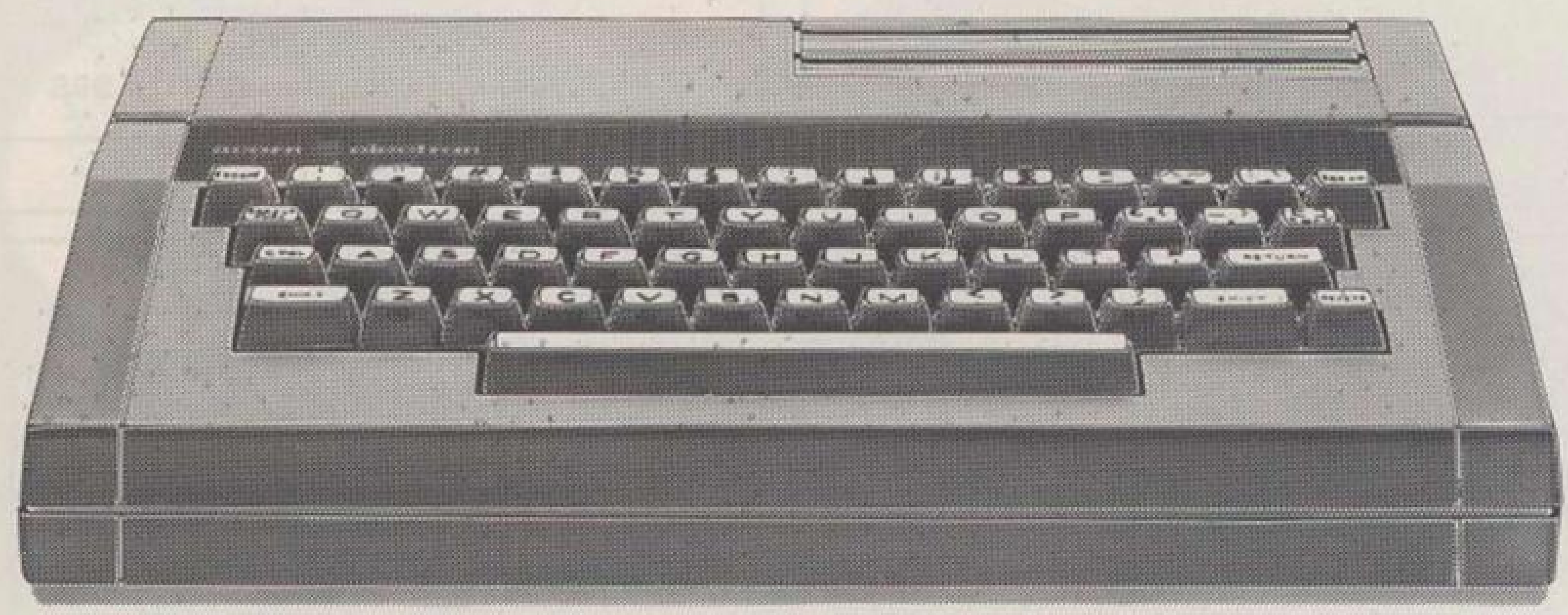


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(continued from page 153)

have to be complex to use but it can keep pace with your developing skills for a long time to come.

The Ade chip is made by System of Sheffield. Ade stands for Assembler Debugger Editor and the 16K chip is a complete, assembly language development system for the BBC. While it is possible to use the assembler in BBC Basic as a macro assembler, it is rather clumsy for programs of any length.

If you want to add short sections of machine code to a Basic program to speed up certain critical sections then you do not need the Ade package. If, on the other hand, you want to write a complete program in machine code then the Ade macro assembler and front panel monitor will become trusted tools.

Ade will assemble a source file whose length is limited only by the disc capacity. 29 pseudo-opcodes give you almost all the control and facilities that you might need. One or two of the pseudo-ops that I have used in Merlin — a macro assembler for the Apple II — are absent, but they are esoteric and not really essential facilities.

The editor in Ade is based on a DEC mini-computer editor called Teco. In addition to immediate commands you may set up a deferred command line which can be a very powerful combination of editing commands.

priority Eprom socket I can move easily around various programs from Basic to View A2.1, from Commstar to Ade and so on.

The Ade reference manual contains more than 80 pages of concentrated, well laid out information. Altogether very good value for serious assembly language programmers.

Clares' Replica II is supplied on a 40 or 80 track disc and its purpose is to take copies of cassette tape based programs on to the disc with very little fuss or bother. The Replica II program has space for up to 16 programs and neither the programs nor the copying software can be copied from disc to disc.

In other words you are allowed to make a disc copy of a cassette program. When the disc is full you will need to buy another Replica II disc if you wish to copy further programs.

Replica II costs £12 and worked well on my Acornsoft Lisp and Forth tapes as well as my Computer Concepts' Logo. You must be using Basic when you start to run the Replica program; it won't work from any other Eprom. I entered the number of sections in each cassette program and told Replica II that the cassette instructions were to Chain the program.

The transfer to disc proceeded automatically and all the programs I have loaded ran normally. Both Forth and Lisp continued to default to the cassette for file handling. Ordinary

DFS assumed to cost £95
Average 5.25 SS 40T 100K disc £130   200K £170
Phloopy costs £113.85

Discs/tapes	10	20	30	40	50	60
tapes	43.10	86.20	129.30	172.40	215.50	258.60
discs	18.00	36.00	54.00	72.00	90.00	108.00
Phloopy total	156.95	200.05	243.15	286.25	329.35	372.45
5.25 total	243.00	261.00	279.00	297.00	315.00	333.00
5.25 200K	274.00	283.00	292.00	301.00	310.00	319.00
Phloopy advantage against 100K disc	86.05	60.95	35.85	10.75	– 14.35	– 39.45

Table 1.

You can also define an editing macro command which will be performed whenever you press the Copy key. I like the Ade package very much even though I have spent hundreds of hours working with Merlin. The Ade editor works differently to the Merlin program but appears to be at least as powerful and, as System points out, you can use other editors such as Wordwise. I tried to edit one file using View but that was not very successful; I don't yet know why.

The third part of the Ade system is the debugger or front panel monitor and disassembler. Unlike many other BBC disassemblers, the Ade program produces machine-code listings which can be saved on to disc, loaded into the editor and reassembled after modification. The front panel commands are comprehensive.

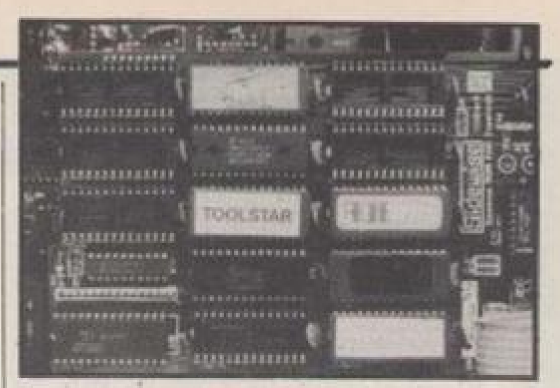
One small but very useful feature is that Ade starts with an asterisk and whatever you type on that line is treated as a "star" command. I have always found it tedious to have to press the Shift key and the Asterisk key together before typing the name of the program I want to use and by mounting Ade in the highest

games programs caused no problems although Clares is careful to say in the instructions "Whilst Replica II has been made as wide ranging as possible there are and there always will be exceptions".

Copy protected discs and locked tapes make me cross and nervous at the same time. Clares says "Should the disc become corrupted either through a drive fault or incorrect usage Clares will undertake to re-copy the disc for a cost of £1.00 cash . . . If it is found upon investigation that the problem was caused by Replica II we will re-copy and refund your £1.00".

That seems a fair offer. Certainly I am delighted to have the accessory languages that I use from time to time available quickly rather than having to wait interminably while the cassette recorder grinds away. Good value.

The original View word processor was plagued by a number of bugs and never achieved the popular acclaim given to Wordwise. View A2.1 is a new, error-free version, and is a far better word processor than Wordwise for all sorts of reasons. I have been using View for the last couple of weeks and I have no doubt that if you are thinking of spending £46



on Wordwise then you should consider paying the extra £12 for a View A2.1 chip.

If you write professionally, when the productivity you achieve is important to you in terms of money, you will recover the additional cost in a couple of weeks or less.

View A2.1 has more facilities than Wordwise and the full screen editing makes it much easier to use. Twenty-nine formatting and editing commands are available using the red function keys and a further 23 formatting and printer commands can be embedded in the text. Although you will need the printer driver program to make the best use of your printer, there are two highlight commands in View which can be used to send control codes of your choice to a printer.

The Search, Change and Replace commands have powerful wildcard facilities. There are commands — Edit, More, Finish or Quit — to cope with documents longer than the available RAM in the BBC Micro. Working forwards through a text is easy but it is a more complicated matter to transfer a section of text backwards over the boundary between text on the disc and text in the computer.

Nevertheless View does allow you to handle long documents using an 80-column display. Wordstar, a CP/M-based word processor, is easier to use in this respect but costs six times as much as View! In some other ways View is more powerful than Wordstar and has a better ergonomic design.

On top of all the powerful text editing functions, for example, you can type in a list of names and addresses and then merge these automatically into a standard letter.

You cannot select certain categories of people from within a list, but that is no disadvantage for many purposes. View will produce all the footers, headers and two-sided headers that you might need for writing a book and can print one chapter after another from disc or tape without any intervention by you.

I think that the full screen editing is the feature of View that I like most and the one that separates it most clearly from Wordwise. Some Apple word processors costing more than £80 work in the same way that Wordwise does and the effect of the text moving around a cursor fixed on the centre line of the screen can be tiring and confusing.

Professional word processors must be easy to use for prolonged periods and View A2.1 meets this requirement. The View A2.1 instruction manuals are excellently produced and clearly written. One or two things are missing in the manuals. There is, for example, a page layout command called CO — comment — which is mentioned at the back of one manual but explained nowhere.

Despite this minor omission View A2.1 is a new piece of software that now represents better value for money than its more well

(continued on next page)

(continued from previous page)
known competitor.

Toolstar is a chip containing a set of utility programs. Unlike an ordinary machine-code monitor, Toolstar is transparent to the MOS. This means that each of the routines in Toolstar "performs its function with stealth and afterwards leaves no trace of its operation".

Using no Basic program RAM, Toolstar functions can be called from within a high level program and the comprehensive manual lists a complete disc editor program written in Basic and using many Toolstar sub-programs.

You can extend the routines within Toolstar by writing your own code and calling it using the *Extend command. Eight Basic tools can be used to modify, edit or repair Basic programs and there are 10 machine-code commands which make up a formidable set of monitor tools.

Tools for industry

Toolstar has four disc filing system commands which do away with the annoying necessity for a formatting disc by providing Format and Verify functions as well as disc sector Load and Save commands. Good value for money, especially for people working with machine code.

Floppy disc drives for the BBC Microcomputer make up a high proportion of all the disc drives sold in the U.K. Despite the benefits, a floppy disc drive with the associated integrated circuits — floppy disc controller, disc filing system ROM and so on — is an expensive addition to your machine.

Table 1 shows the real costs of the Phloopy system from Phi Mag Systems Ltd compared with a floppy disc drive with the same storage capacity. The table was constructed to show how the initial cost advantage of the Phloopy systems is progressively eroded as you purchase more discs or tapes.

The break-even point occurs at 44 tapes assuming that there is no change in relative prices. However, you should not be put off by the relatively high cost of the tapes as you will have 4.4 Megabytes of programs or data stored away before the floppy disc becomes more economical.

The Phloopy drive differs from the Hobbit and Ultradrive systems which use cassettes of tape wound from one spool to another to store and retrieve information. Instead, the Phloopy uses a continuous loop of tape like the Sinclair Microdrive. However, the Phloopy is unique in that it stores in parallel format on tape.

By storing data eight bits wide with a ninth clock track, the Phloopy system offers a high packing density and short access times. The drive mechanism and data transfer are controlled by an 8049 microprocessor inside the Phloopy case while a 6821 chip acts as the interface to the main computer. Once you have passed a command to the Phloopy microprocessor, *Format, for example, you can get on and do something else with the BBC while the Phloopy carries out the command.

The Phloopy interface is not compatible with the interface for ordinary floppy disc drives. Installation should not be difficult; you are required to insert four components on to the main board while a couple of resistors must be disconnected.

The following new commands are available in the Phloopy "LFS" — Linear Filing System?

*HELP PHLOOPY	*PHLOOPY
*DELETE	*RENAME
*DRIVE	*TITLE
*FORMAT	*UNLOCK
*LOCK	*VERIFY
*INFO	*COPY
*TRANSFER	*anothername

Additionally, all the normal Basic file handling instructions are available. The new commands are a subset of those in the floppy disc filing system but seem adequate for the tape drive.

*Transfer is a new command that will load a program from a normal cassette tape and transfer it automatically to a Phloopy tape. "*another name" means that the system will look for a machine-code file with a matching name and then load and *Run it.

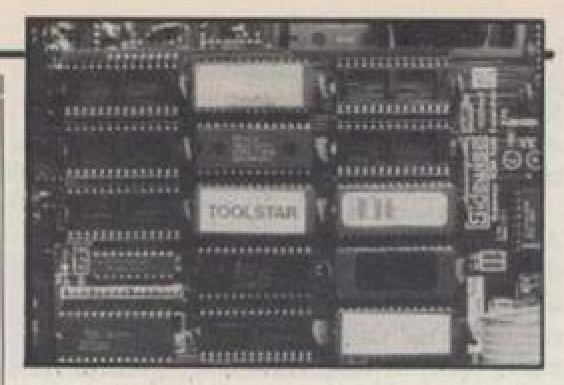
The delay while you wait for the tape to reach the start of your program is certainly longer than you will experience using floppy discs. Conversely, it is far faster to use a Phloopy than it is to store programs on ordinary cassettes. If you have a limited amount of money and reckon that you can cope with transfers of data to and from other computers using the RS-423 port — with the excellent Commstar, for example — then I think the Phloopy tape system could be a very good buy.

The Viglen ROM system makes clever use of the hole in the top cover of the BBC machine just to the left of the keyboard. Designed originally to accept a ROMpack which would load serial data for the speech processor, the hole has been used by Viglen to mount a socket which is connected directly to one of the paged EPROM sockets on the main circuit board.

One immediate advantage of the system is that you need not open the case of the computer to change ROMs but there are other benefits as well. The Viglen ROM extension contains only passive components and uses no power until you plug a cartridge into the socket.

CONCLUSIONS

- There is some very sophisticated software available for the BBC Micro at some very competitive prices. The British Broadcasting Corporation's decision to renew their contract with Acorn Computer for another four years will reinforce the strength of the BBC Micro both in the U.K. and in many countries abroad.
- The BBC computer is quite expensive but the initial capital cost is a very good investment if you seriously wish to use your computer for more than one job. If you want to play games only then the BBC machine may give you what you want. If you want to use a computer for word processing, laboratory or instrument control, small scale-number-crunching, teaching normal or handicapped children, communicating with other computers — then the BBC Micro is supreme.
- The additional software and hardware described in this review do add to the BBC Micro's capabilities; whether one or another item will help you or entertain you at a price you can afford is for you to decide.



Consequently, you will have more power to use for other purposes from the internal power supply and less heat inside the machine's case. If you need to transfer a ROM or Eprom from one machine to another, in a classroom, for example, the Viglen system could be very attractive.

Equally, if you want to install a special board inside the case of the BBC Micro you may find that it won't fit alongside an ordinary expansion ROM board.

A set of five empty cartridges will cost you over £27 in addition to the £19.95 for the original cable. Other single ROM extension cables are becoming available using zero-insertion force sockets to hold the EPROM.

Only you will be able to judge the relative merits for your own needs — certainly the Viglen ROM system works well and does offer good physical protection to your — expensive — paged ROMs.

There are a number of ROM extension boards made for the BBC Micro; most of them will work satisfactorily in an unexpanded machine. Whether or not a board will operate with one of the second processors or with one of the numerous double-density disc filing systems is another matter. Ideally you should see the ROM board installed and working in your machine before paying for it. Having said that, the ATPL Sidewise board from Advanced Technology Products has a good reputation.

The ATPL board expands the paged ROM facility of the BBC Micro from the original four sockets to the full 16 supported by the operating system. Links can be made or cut to allow you to install either 8K or 16K ROMs or Eproms in the first 10 sockets; another link permits the use of 4K 2732 chips in the first three sockets.

The 15th socket is split into two and may be filled either by 8/16K ROMs or by two 8K CMOS RAM chips. The Sidewise board contains the circuitry to provide battery back-up for the CMOS RAM — a kit can be obtained from ATPL to upgrade the board. The CMOS RAM chips can be write protected and, with the additional battery, can then act like read only memory.

There are 10 integrated circuits on the ATPL board apart from the Eproms and these are all small chips that will draw comparatively little power from the computer's power supply.

The installation instructions are not difficult to understand or carry out except that you must be careful of two power supply connectors on some later issue machines. No soldered connections are necessary; the Sidewise board simply plugs into two IC sockets — the displaced chips fit into the extension board.

My ATPL board works perfectly in my otherwise standard BBC Micro. It saves time and provides a permanent housing for the Eprom programs that I have collected.



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- All entries must arrive at the *Your Computer* offices by the last working day in November 1984.
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What would you use it for? ______________

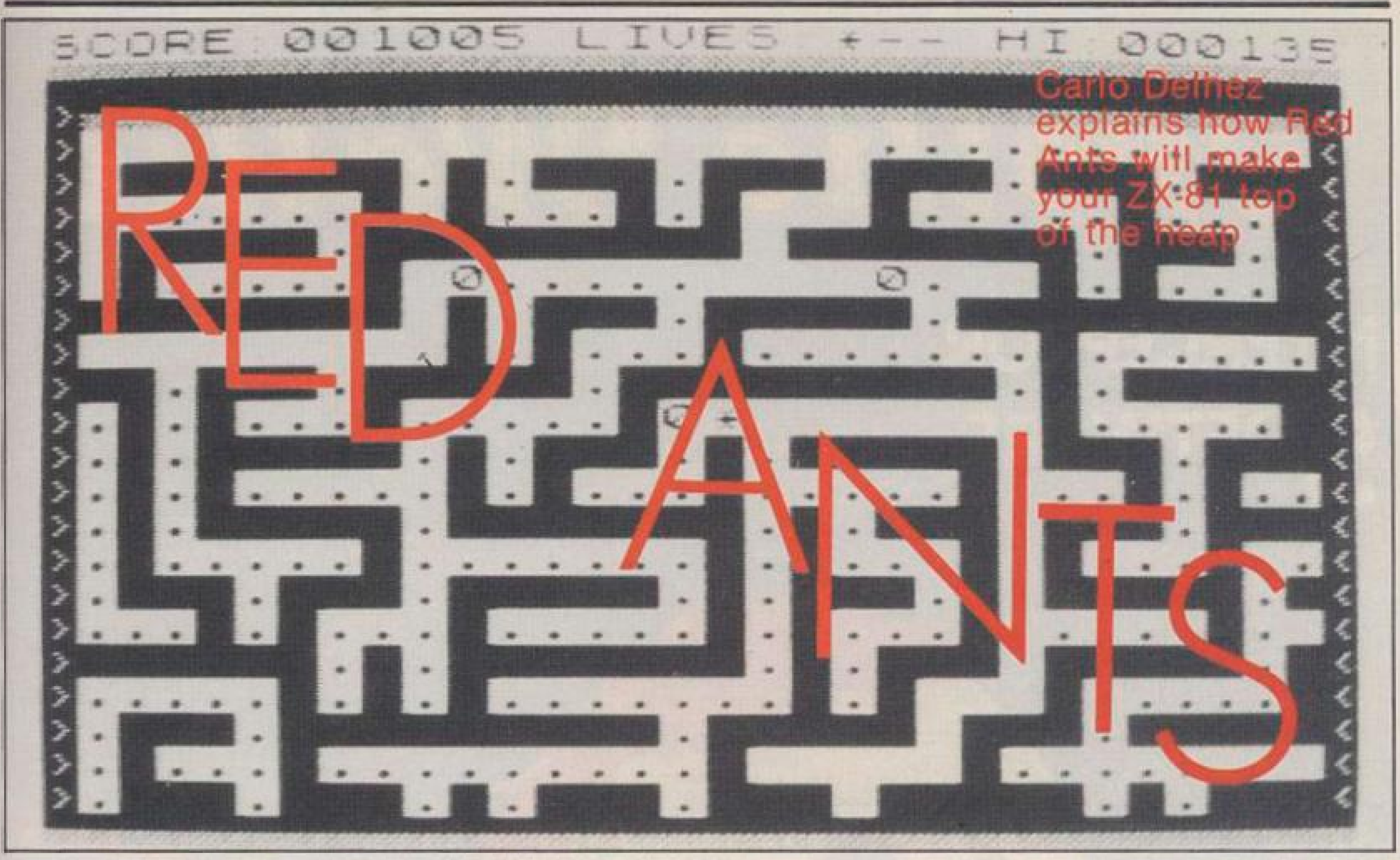
What would you call it? ______________

Name ______________

Address ______________

RED ANTS

Carlo Delhez explains how Red Ants will make your ZX-81 top of the heap



THIS GAME MAKES full use of the capabilities of your ZX-81: it consumes the entire 16K RAM and gives fast, smooth and impressive action-graphics during the play.

The game is set in an enormous ants'-nest, measuring more than eleven times the size of the screen. The top of the maze is a long corridor — at ground level — from which lots of galleries are dug into the earth, all coming to a dead end sooner or later after being split up several times. The ants'-nest maze has no exit. Each time you start a new game, a new nest will be "dug"; this takes some five seconds.

Sixteen ants walk through the nest while laying their eggs. It's your mission to collect as many eggs as possible, while watching out for these awful ants: they do not chase you, but as the game progresses they run faster and faster, which makes avoiding them increasingly difficult.

You need imagination, patience, quick reactions, persistence and, of course, a supply of luck to play this game. But these abilities are also needed when entering the program. So, brace yourself!

The program consists of 3355 bytes machine code, stored in one large Rem, and 1786 bytes Basic. The rest of the RAM will be filled by variables.

Entering the machine code is the toughest part. First, clear your ZX-81 by typing:

```
RAND USR 0
```

Second, space needs to be reserved for the machine code. Enter a line 1 Rem followed by 128 characters — i.e., four full lines. Then, edit this line 23 times to get lines 2 up to 24 inclusive. Finally, edit line 24, change to 25 and add five characters. By now 3355 bytes should be reserved. Verify this by:

```
PRINT PEEK 16396 + 256 * PEEK
        16397 – 16509
```

If a number other than 3355 is printed, you must start all over again.

Third, enter the hex-loader — program 1. Before running the hex-loader, enter subjoined Pokes as direct commands.

```
POKE 16510,0
POKE 16511,23
POKE 16512,13
POKE 16514,118
POKE 16515,118
```

These Pokes will convert the 25 Rem lines to one large Rem statement, stored in line 0. List will only show:

```
0 REM
```

List 1 will show the rest of the program. Now Run the hex-loader.

It expects two inputs — the start address and the finish address. Enter 16514 for the start. If you intend to type in the entire program in one go enter 19863. But if you prefer to type it in over several sessions enter a lower figure; save the code you have already typed and when you resume typing start up where you finished previously.

- Enter Code; Press E. Type the starting-address in decimal. Now you can enter a string of hexadecimal numbers. If the program finds anything wrong in this input, the screen will be cleared, the address where things went wrong is displayed, and a new input asked. Enter a single Q to quit and return to the main menu.
- Check Code; Press C. Enter the starting-address in decimal. The screen will then be filled with the hexadecimal address-contents from this address onwards. Pressing Q during the printing or after a screen-fill will return to the main menu. Pressing any other key after a screen-fill will show the contents of the next 168 addresses.
- Save Code; Press S. The program will be Saved. It is best to repeat this several times while entering the code, in case the final version won't Load properly.

If everything has been entered correctly, delete the hex-loader and make a few tape-copies of the code. When you have reached this stage, you are very near the finish. Just a little more patience . . .

The final stage is to enter a small Basic-program. Don't make mistakes, especially don't be mistaken with addresses preceded by USR and Poke.

You will find that space-saving-techniques, like the use of Val, have been applied. These are really necessary, so do not omit them or the program won't run properly.

By now, you have reached the end. First Save the program by:

```
SAVE "RA*BACK-UP"
```

and then

```
RUN
```

The program will be Saved once again and then . . . the long awaited result. If now, or at any other stage later on, a crash occurs reload the program containing both the complete Rem with machine code and the hex-loader, and re-check the code. If you cannot find an error, reload the back-up copy by

```
LOAD "RA*BACK-UP"
```

and check the Basic-program in which you should find the error.

Let's hope you did not come across a crash. Press Y to get instructions. Read them carefully. If you think the instructions scroll up too fast or too slow, break out directly after the instructions, when "press any key" occurs, and change the number Poked in line 110. A number higher than 160 will make them go slower, a number less than 160 will speed them up. Run again by

```
RUN 10
```

If you have read the instructions, you are asked to press a key after which the starting-temperature can be adjusted. To do this, press 8 to increase or 5 to decrease the temperature. If the correct temperature has been gained,

(Continued on page 165)

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(Continued from page 163)

press Newline. A temperature of less than 22 degrees makes the ants move slower than you, at 22 degrees, they move at the same speed as you, and a temperature of more than 22 degrees will make them move faster than you do. At 30 degrees, the game is hardly playable. You'd better start with 0 degrees.

When the temperature has been adjusted, a message appears to say the game will start within five seconds. During this period, the ants-nest is "dug". It's advisable to press the F-key during this period and to keep it pressed. For when the game starts, there will be no action at all until you release the key. So, keep F pressed.

Now you will see the ants'-nest. Three quarters of the screen is blank: this is the outside of the maze. One quarter, in the bottom right-hand corner, shows a maze. In the top left-hand corner of this maze — the middle of the screen — you see an asterisk. That's you. A few lines underneath you, there's a nought; that's an ant. Take your finger off the key for a short moment; the ant will move and leave full stops behind it. These are the eggs. Now you can release the F-key and start walking. Use the keys: I = up; Z = left; C = right; M = down.

Begin by pressing C for some moments. You will see that you keep steady, while the maze moves to the left.

When you eat the first egg, you will see some bars running across the screen. This also happens every 1000 points. The ants will then speed up.

If you get bitten, you'll see this three times in succession and you will be repositioned in the top left-hand corner of the maze. The ants will then slow down.

After being bitten three times, a nice "Game Over" appears. Press any key to start all over again.

Finally, here are a few useful hints concerning some possible alterations.

If you do not like the key combinations for steering, or there is a need for other keys in order to use a certain joy-stick, you can easily alter the keys for movement. This is done as follows:

POKE 18664)
POKE 18712 > ,Code of character Up
POKE 19834)
POKE 18669)

Hex loader.

```
 99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CODE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT AGAIN"
300 GO TO 150
310 NEXT N
```

POKE 19852 > ,Code of character Left

POKE 18681)
POKE 19825 > ,Code of character Right

POKE 18695)
POKE 19843 > ,Code of character Down

Not only has the steering been changed by these Pokes, but the instructions have also been altered accordingly.

The hi-score is stored at the addresses 17046 up to 17051 inclusive. You can Poke in some hi-score or reset it to zero. Resetting to zero, however, can just as well be done by reloading the program.

If you are satisfied with the program, and you do not want to change it any more, it can be made break-proof. This means that, if you try to break while the computer executes a Basic-line, this interrupt-driven routine will respond with the execution of a RST 0, i.e., a full system-reset. To achieve this, edit line 10 and change the Peek into USR. Now Run, record on tape and try to press Break. There will not be much program left if the cursor re-appears. This is a very good protection against burglary.

I am fully aware of the fact that typing this program is anything but a pleasant occupation. Therefore, I can supply you with a good-quality tape version. To obtain such a tape, send £3 to Carlo Delhez, Emmastraat 3, 4651 BV Steenbergen, Holland.

Basic program.

```
  6 REM ()5??TAN GOSUB ?** Y PRINT LN ▀*U RND RETURN COPY CODE LN ▀*LN 4*()5??▀*00
  7 REM RETURN C4▌Y*?ZPI RETURN I4▌Y*?ZPI RETURN M4▌Y*?ZPI RETURN ZTAB ▀RND▀?ZPIXXX
  9 SAVE "RED ANTS"
 10 LET Q=PEEK VAL "19780"
 11 LET Z$="      ""RED ANTS"" HAS BEEN LOADED     SUCCESSFULLY"
 12 RAND
 13 POKE VAL "16418",SIN PI
 20 LET Q=USR VAL "17338"
 30 PRINT AT VAL "7",SIN PI;Z$
 40 PRINT AT VAL "4",VAL "4";"(C) J.L.DELHEZ, 8-1984"
 50 PRINT AT VAL "12",VAL "6";"           ";AT VAL "13",VAL "6";" PRESS ANY KEY TO ";AT VAL "14",VAL "5";" GET INSTRUCTIONS ";AT VAL "15",VAL "6";"          "
 60 PRINT TAB VAL "2";"PRESS ""N"" TO SKIP-OVER THEM"
 65 POKE VAL "17554",VAL "2"
 70 LET NO=VAL "10"
 80 LET QQ=USR VAL "19758"
 85 LET Q=USR VAL "17428"
 90 GOSUB 500
100 IF QQ=VAL "61312" THEN GOTO VAL "140"
110 POKE VAL "16226",VAL "160"
120 LET Q=USR VAL "16157"
122 DIM L$(VAL "30")
125 PRINT AT VAL "22",PI/PI;"     PRESS ANY KEY     "
130 IF INKEY$="" THEN GOTO 130
132 PRINT AT 22,1;L$
135 LET NO=VAL "11"
136 GOSUB 500
140 PRINT AT 10,1;"ADJUST THE INITIAL TEMPERATURE: 0 = A BORING GAME, 30 = A HARD GAME. USE KEYS 5, 8 AND N/L."
150 PRINT AT 15,8;"          ";AT 16,8;"    DEGREES ";AT 17,8;"          "
160 PRINT AT VAL "16",VAL "10";"00"
170 POKE 17104,VAL "5+.5*USR 19663"
175 LET Q=USR VAL "17428"
180 LET NO=VAL "12"
190 GOSUB 500
200 LET A$="*****************************************"
210 PRINT AT 10,1;A$( TO 30);AT 12,4;"THE GAME WILL BE STARTED";AT 13,8;"WITHIN A MOMENT";AT 15,1;A$(2 TO )
215 LET Q=USR VAL "17428"
220 CLEAR
225 POKE VAL "17554",PI/PI
230 DIM B$(1E4)
240 LET Q=USR VAL "16516"
250 POKE 19767,VAL "406-PEEK 19767"
260 LET Q=USR VAL "19758"
270 POKE 19767,VAL "406-PEEK 19767"
280 LET Q=USR VAL "17720"
290 LET NO=VAL "22"
300 GOSUB 500
302 CLEAR
305 LET Z$="        ""RED ANTS"" IT""S AN     ADDICTIVE MAZE-GAME."
310 GOTO VAL "30"
500 POKE 16224,201
510 FOR K=1 TO NO
520 LET Q=USR 18188
530 NEXT K
540 POKE 16224,1
550 RETURN
```

Hex dump.

```
16514: 7676CDE7433E80CD = 1134
16522: DD40E516241E65CD = 908
16530: B540152805CDC340 = 775
16538: 18F53E88E1E5CDB5 = 1307
16546: 4006457711640019 = 400
16554: 772310F71CCDB540 = 895
16562: C3EB40D577231D20 = 922
16570: FBD1C92A7B40C352 = 1167
16578: 41D5368023 1D2806 = 570
16586: 3600231D20F4D1C9 = 804
16594: E52A0C4011420019 = 455
16602: EBE1C92A1040117C = 924
16610: 0419C901009BFFFF = 896
16618: FFE1013223116600 = 685
16626: 19FD362100FD3521 = 704
16634: 282F3A32408785FD = 780
16642: 77338187FD8634FD = 1126
16650: 7732D60330FCED44 = 991
16658: 3D87E521E5401600 = 773
16666: 5F195E2356E1EB19 = 820
16674: 7EEBFE8020CF3E00 = 1044
16682: 1223230D20C30E32 = 392
16690: 10BBCD9C42CDDD40 = 1120
16698: 1E653E89D5CDB540 = 993
16706: 11391B19D13CCDB5 = 781
16714: 402A104011E20419 = 458
16722: 227B403617E5CDBA = 918
16730: 43E10600287E04FE = 725
16738: 8820F978FE0F303E = 916
16746: 3E21402A7B4048AF = 623
16754: 47ED42118D03ED52 = 854
16762: CDD2403E15F5E53E = 1098
16770: 0F914F971313120D = 459
16778: 20FB13FD46213E0F = 735
16786: 80EDA03D20FBE113 = 1113
16794: 01650009FD4E21F1 = 716
16802: 3D20DAC313422A7B = 756
16810: 400600237E04FE88 = 625
16818: 20F978FE0F3037FD = 1026
16826: 77212A7B40119C03 = 557
16834: A7ED520615CDD240 = 992
16842: 13130E1081E5EDA0 = 823
16850: 033D20FAE11AFE93 = 998
16858: 2805AF121318F613 = 546
16866: D5116500 19D1FD7E = 944
16874: 2110DDC313422A7B = 715
16882: 40119C03AFED52CD = 939
16890: D2400615131 3E50E = 582
16898: 1EEDA0030D20FAE1 = 950
16906: 13D5116500 19D110 = 600
16914: EB0606C5CD1843C1 = 933
16922: 10F9CDBB025514CA = 966
16930: BD40444DCDBD077E = 925
16938: FE262001C9FE2828 = 863
16946: E9C37040BD40FE25 = 1161
16954: D2BD40D621872 16A = 984
16962: 424F0600095E2356 = 375
16970: 2A7B403600197EFE = 688
16978: 18280DFE1CCACA44 = 834
16986: FE00C2BD40C35241 = 1043
16994: E5CDA244E1C35241 = 1231
17002: FFFF65009BFF0100 = 1022
17010: C901009BFFFFFF65 = 1223
17018: 00C9382834372A0E = 460
17026: 1C1C1C1C1C1C0031 = 217
17034: 2E382A380E171717 = 288
17042: 002D2E0E1C1C1C1C = 217
17050: 1C1CCDDD40015804 = 639
17058: 09061011D542ED53 = 647
17066: 1643EB1AFE002803 = 647
17074: 1318F83E1C127323 = 549
17082: 7223360123360023 = 328
17090: 0EA5130D20FC10E3 = 738
17098: 3E10321543 3E0632 = 334
17106: 1442C93560010074 = 553
17114: 609BFF1A619BFFBF = 1230
17122: 619BFFCA6201006F = 919
17130: 6301001984010 0C1 = 419
17138: 6401006765010 00C = 318
17146: 6601008166010058 = 469
17154: 67010001680100A8 = 381
```

(Continued on page 167)

(Continued from page 165)

```
17162: 68010055590100FA = 546
17170: 6901000AED422A16 = 483
17178: 434E23463E1502AF = 516
17186: 235E2358C5D5CD9D = 1022
17194: 43C1E1197EFE17CA = 1115
17202: C844FE002843FE1C = 911
17210: 283FFE18283BC9D1 = 889
17218: 2A18437E23666F19 = 530
17226: 7EFE1C282CFE17CA = 971
17234: C844FE002823FE18 = 878
17242: 281F2173427E2348 = 516
17250: 23B820F978BA20F5 = 1086
17258: 2B2B2B7EFEC92004 = 745
17266: 0108000552B85E18 = 285
17274: C7E5C12A16437123 = 900
17282: 7023732372233E1C = 506
17290: 023A15433D200521 = 279
17298: C5423E1022164332 = 530
17306: 1543C92173427E23 = 554
17314: 4623BB20F9738A20 = 911
17322: F57EFEC920050109 = 873
17330: 00AFED425E2356C9 = 894
17338: 06202A0C40117C42 = 353
17346: 231A771310FA231E = 530
17354: 203E8A23CDB5400E = 731
17362: 15233692111F0019 = 329
17370: 3693230D20F31C3D = 613
17378: 23CDB540C9217C42 = 909
17386: 1106001943361C23 = 232
17394: 10FB1C1906033617 = 406
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17418: FE54C0CD1444CD6F = 1139
17426: 44C92A0C40232299 = 609
17434: 44229C44111F0019 = 400
17442: 229F4411D8021922 = 555
17450: 9E443E2032A144FE = 850
17458: 09381B2A8944CD78 = 680
17466: 41232299142A9B44 = 623
17474: E5CD7844E1112100 = 897
17482: AFED52229B442A9D = 950
17490: 44E5CD8444E12322 = 995
17498: 9D442A9F44E5CD84 = 1060
17506: 44E128229F443AA1 = 816
17514: 443D20C0C9211442 = 673
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17538: 904406187EC68077 = 813
17546: 1121001910F60100 = 338
17554: 020B78B120FBC960 = 890
17562: 5727546854475401 = 554
17570: 217C42110B00197E = 402
17578: ED44C63D77FE21CA = 1172
17586: FE432B7EFE0ECAE7 = 1191
17594: 433CFE262004361C = 537
17602: 18F077C3FE43C1D1 = 1301
17610: CD1444CD1444CD14 = 811
17618: 44217C4206021115 = 337
17626: 00197EFE1728072B = 516
17634: 10F835C31045353A = 708
17642: 14423D3214422A7B = 448
17650: 403600CDDD401166 = 727
17658: 0019C35241217C42 = 590
17666: 11060019E5111400 = 314
17674: 19D1EB0606C9CDFF = 1142
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17698: CDFF447E12231310 = 742
17706: FA18F1C33C7A7600 = 1010
17714: 02B101EA76760E15 = 685
17722: 2A0C4011440019E5 = 457
17730: 061E360E2310FBE1 = 631
17738: 0D280511210018EE = 370
17746: 2A0C401144001911 = 245
17754: 88451AE54F060009 = 554
17762: 131ACB7720047723 = 557
17770: 18F6FECD2804CBB7 = 1159
17778: 18EAE1131AFEFF28 = 1077
17786: 060121000918DCCD = 498
17794: BB022C28FAC90604 = 734
17802: 4487CD0685440546 = 690
17810: 06030444372A29CD = 424
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17826: 83004428333938CD = 605
17834: 0304044202838301 = 342
17842: 47868301060304CD = 555
17850: 0388014206000086 = 344
17858: 4487060143870605 = 423
17866: CD04054187010585 = 553
17874: 0204430502014386 = 282
17882: 8301060604CD0387 = 491
17890: 0141020404878701 = 347
17898: 42870148050505CD = 494
17906: 0306428786020106 = 353
17914: 0441870643060304 = 290
17922: 43050505060304CD = 300
17930: 0305830386098989 = 559
17938: 0906030141878741 = 419
17946: 05000546820300CD = 418
17954: 0087044102438609 = 416
17962: 0906440206418683 = 421
17970: 0105000543868301 = 344
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17986: 0905440645050005 = 167
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18034: 40868301060304CD = 561
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18050: 820300CD05870141 = 544
18058: 0686410204460E0E = 309
18066: 0E0E0E43058604CD = 457
18074: 058541060A0A8641 = 423
18082: 05CD050641070A0A = 313
18090: 844186430E2F1B31 = 535
18098: 18292A312D2A3FCD = 514
18106: 050541840A0A0741 = 299
18114: 85CD020286064386 = 683
18122: 0643860601411028 = 335
18130: 110E24181D252420 = 225
18138: CD003E2802014A02 = 386
18146: 01CDFF760003DE05 = 809
18154: EA7676CDBA43113A = 1003
18162: 47D52A0C40110802 = 637
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18178: 231318F6131AFEC9 = 824
18186: C8D52A0C40114400 = 616
18194: 19E511210019D101 = 539
18202: 1E00ED8006031323 = 508
18210: 10FC7EFE8920F0AF = 1232
18218: 061E121310FC0100 = 342
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18234: 0BBE313A3700A834 = 586
18242: 32353A392A370BFF = 581
18250: 3537343A29313E00 = 370
18258: 35372A382A333938 = 412
18266: 0EFFFF121212000B = 589
18274: B72A2900A6333938 = 596
18282: 0800131313FFFF26 = 618
18290: 38003C372E39392A = 373
18298: 3300273E00A82637 = 413
18306: 313400A92A312D2A = 448
18314: 3F18FFFFFFA92A26 = 1104
18322: 3700B531263E2A37 = 482
18330: 1AFFFFB92D2A0034 = 860
18338: 272F2A2239003428 = 320
18346: 0039202E38002629 = 283
18354: 2F2E28392E382AFF = 586
18362: 2C28322A002D2638 = 313
18370: 00272A2A3300302A = 264
18378: 353900382E323531 = 364
18386: 2A0EFFAE390B3800 = 609
18394: 3E343A3700392638 = 378
18402: 3000393400283431 = 295
18410: 312A2839002638FF = 537
18418: 3228333E00263339 = 347
18426: 162A2C2C38002638 = 302
18434: 0035343B382E2731 = 351
18442: 2A1A002E33FF3437 = 527
18450: 292A370039340037 = 302
18458: 2A28282D0026002D = 248
18466: 2E2C2D0038283437 = 338
18474: 2A1BFFFFB9340026 = 854
18482: 282D2E2A3B2A0039 = 331
18490: 2D2E381A003E343A = 345
18498: 003C2E313100272A = 285
```

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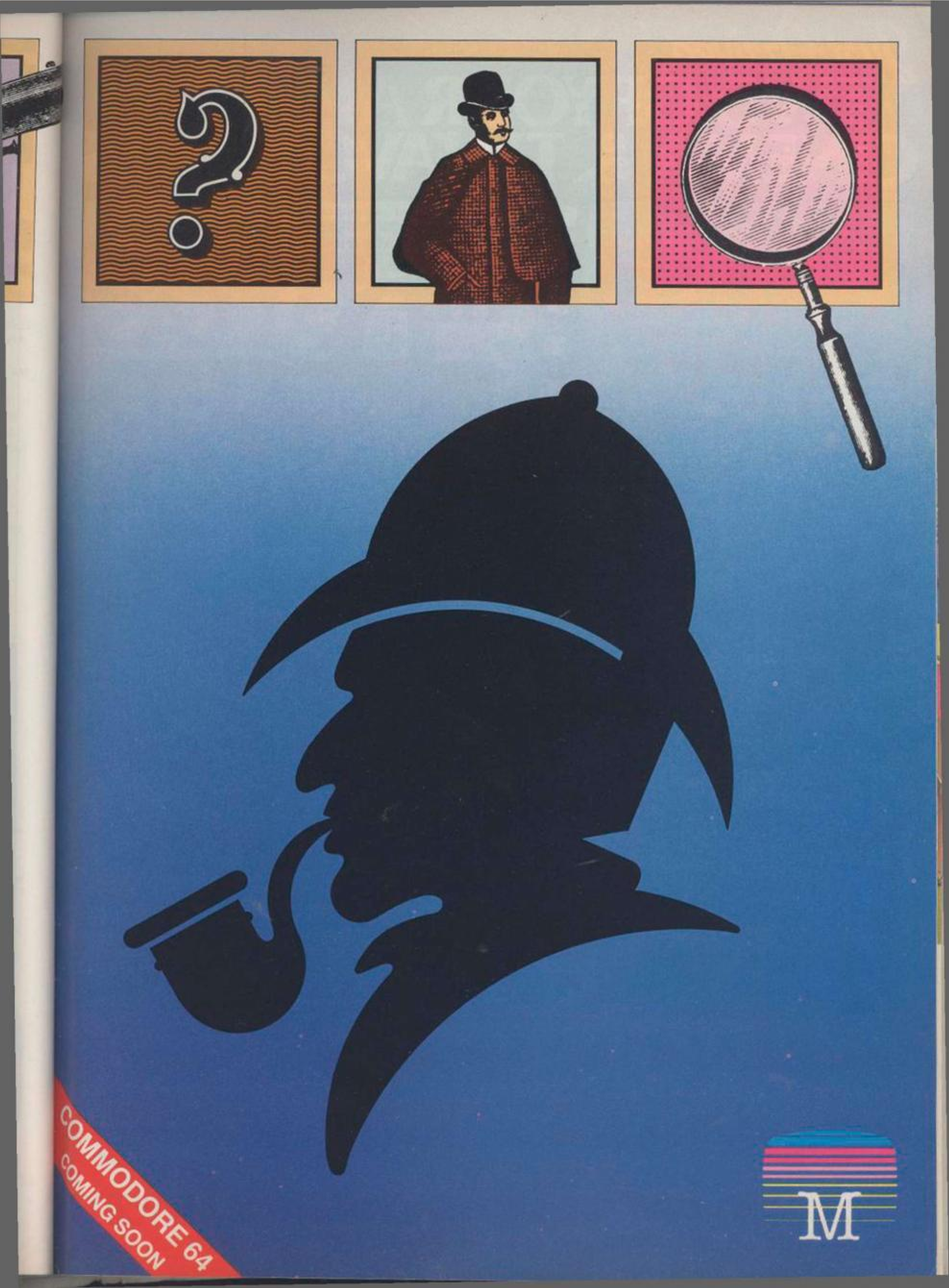
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(Continued from page 167)

```
18506: FF3534382E392E34 = 617
18514: 332A29002E330039 = 288
18522: 2D2A003934350031 = 298
18530: 2A2B3916FF2D2633 = 553
18538: 290028343733 2A37 = 336
18546: 00342B002633002A = 226
18554: 33343732343A38FF = 629
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18570: 391B00B92D2A372A = 453
18578: 28373432003E343A = 372
18586: 00282633FF372A26 = 519
18594: 282D002A3B2A373E = 345
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18610: 002E3300392D2AFF = 496
18618: 32263F2A1BFFFFB2 = 908
18626: 343B2A322A333900 = 353
18634: 2E38002626282D2E2A = 313
18642: 3B2A2900273E0020 = 275
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18666: 3A35FF3F14312A2B = 583
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18762: FF3C2D2E282D0032 = 541
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18842: 392D2E332C380026 = 337
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18882: 39002D2E2C2D2A37 = 334
18890: FF392A32352A3726 = 592
18898: 393A372A381BFFAB = 721
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19082: 28392E343338003E = 364
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19098: 292F3A383900392D = 361
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19138: 00283A37392D2A37 = 355
19146: FF392D2633001E1E = 506
19154: 00292A2C372A2A38 = 322
19162: 1A003437003E343A = 305
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19194: 181818FFFFAE3300 = 816
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19226: 322AFF2628373438 = 588
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19338: 342B00392D2A001D = 268
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19690: 18E83A2140FE0028 = 705
19698: E13D3221402A0E40 = 553
19706: 28357EFE1B20E936 = 822
19714: 2518F53A2140FE1E = 745
19722: 28DE3C3221402A0E = 525
19730: 402B347EFE26 20BA = 795
19738: 361C18F53A214006 = 512
19746: 004FC9C976000514 = 624
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19762: 4D511420F7CD8145 = 860
19770: E5C1C9C976000628 = 988
19778: 00EADD21494DC9ED = 1076
19786: 5F0101193EF5CDB5 = 815
19794: 023A0040FEFFC400 = 829
19802: 00CD9202CD2002DD = 813
19810: 21494DC3A4021C1C = 600
19818: 7600072900EAFE28 = 694
19826: 20053E03C33F42FE = 680
19834: 2E20053E02C33F42 = 471
19842: FE3220053E01C33F = 662
19850: 42FE3FC2BD40AFC3 = 1200
19858: 3F423D3D3D76 = 430
```





COMMODORE 64
COMING SOON
M

RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

STATIC MICRO

■ I am 16 years old and have had many problems with computers. My first computer was a 16K Spectrum. This worked well for a month but developed keyboard trouble and was returned for a replacement. The replacement wouldn't Save, so was sent back for a refund. With this money, I bought a TI 99/4a. This was found to have faulty colour, so was replaced. Since then, I have had four more TI 99s, all of which have developed various faults, the most serious of which was a total loss of function — couldn't even get the "power on" light to work. A friend of my mother's said he had heard that some people cannot use computers because of bodily static electricity. Is this possible, or have I just had bad luck? Incidentally, I have used a friend's computer regularly, without any trouble. I hope you will answer this, as I am still interested in computers and hope to get an Electron if I get a positive reply.

Andrew McDermott,
Halifax.

SHADES OF The Omen! Your story, Andrew, about static electricity seems to me to be as valid as the fear many parents have that using a computer connected to the TV will somehow ruin the television. Certainly, some computer components can be destroyed by static electricity but this is the first time I've heard a claim that evil powers in the operator would render the computer inoperative.

My experience with TI 99/4a's has been all positive. They seem to work reliably — albeit excrutiatingly slowly — and friends of mine who have them have reported no excessive failure rate.

The fact that you can use your friend's computer without causing it to self-destruct suggests, to me, that there may be problems — if such things are possible — in the wiring of your house. Unusual electrical surges could be, at least, blowing fuses — which sounds like what happened with your fourth TI. For what it's worth, you might like to chat with an electrician about your house wiring and enquire at the same time regarding the stability of the power supply in your area. Have you tried running your friend's computer at your home?

SPECTRUM BUG?

■ I think I have found yet another bug in the Sinclair Spectrum ROM. I was writing a simple program in which the user enters the three lengths of the sides of a triangle. The length of the longest side is entered first, followed by the other two. The program then prints a message showing if the triangle is a right-angled one. When I was testing the program — which I was sure was correct — I entered the numbers for the 26, 24, 10 right-angled triangle. To my surprise, the computer told me the triangle I had entered was not a right-angled one — which it is! Is it me or my Sinclair computer which is wrong? Here's the program:

```
10 INPUT "LONGEST SIDE FIRST";A
20 INPUT "NEXT SIDE";B
30 INPUT "NEXT SIDE";C
40 IF C^2 + B^2 = A^2 THEN PRINT
   "A RIGHT ANGLED TRIANGLE":
   PAUSE 1:PAUSE 0:RUN
50 PRINT "NOT A RIGHT ANGLED
   TRIANGLE":PAUSE 1:PAUSE 0:
   RUN
```

Darren Patridge,
Tiptree,
Nr Colchester.

CLAIMS LIKE THIS, Darren, are heard very frequently. The problem lies not in your Spectrum, but in the way which *all* computers store numbers. They are never stored exactly. Even my IBM PC will inform me that 85/100 equals 0.849999. Certain micros available on the UK market will solemnly inform you that 4/2 does not equal 2 — because the computer stores 4/2 as 2.000001.

The way to test what your computer is really doing, in this and any other program in which you wish to compare the results of calculations, is to get the computer to print out its findings, i.e., tell it to Print C^2, B^2, A^2 and compare the three. Then, instead of looking for an exact match, get the computer to look for a minimum difference. In your case, line 40 could read:

```
40 IF ABS((C^2 + B^2) - A^2)<.0001
   THEN PRINT "A RIGHT ANGLED
   ..."
```

HOW GOOD IS MSX?

■ I have read a lot about MSX Basic in the past few months. I understand that it is a new standard so that you can run software written for one MSX computer on another. How well is MSX going to be accepted in the UK?

Martin Barlow,
Albany.

IF I COULD PREDICT the future, Martin, I would not be writing for *Your Computer*. No-one knows whether or not MSX will ever get off the ground. Certainly, Microsoft in America, who invented it, are pushing for it to become the standard. More than 30 — at last count — Japanese manufacturers have either embraced the standard — or said they will in due course. My guess is that it will gain a certain acceptance over the next two years, so that it runs parallel to the de facto standards we have here such as Sinclair Basic and BBC Basic. It has, I believe, little chance of dislodging Microsoft Basic — as in PC-DOS on the IBM PC — in the States — although Microsoft and MSX Basics are very, very close; except for the graphics and sound.

The MSX standard is built around a Z-80A processor, and specifies such things as sprite control in the graphics, single channel sound, a Centronics printer interface, Atari-type joystick ports, cassette output — 1200/2400 baud — and three graphics modes — two text 32 × 24 and 40 × 24 and one "hi-res", which is 256 × 192.

So long as you stick with one of the biggies in the UK — such as the Spectrum or the Beeb — you have little chance of buying a machine whose support dwindles to nothing in the next 18 months.

CHEAPER BEEB

■ At the moment, I am saving up for an Electron, but I would have preferred a BBC Model B. Could you please tell me if the BBC Model B will be coming down in price in the near future?

S G Hornby,
Warton,
Preston.

ONE NEVER knows what thoughts lurk in the minds of those at Acorn, but the chances of the Beeb coming down in price seem to me to be very, very slim.

BUSINESS PROGRAMS

■ I have a Vic-20 micro and cassette recorder in good working order. My problem is that I had a brain stroke two years ago which has impaired my memory and manual dexterity. I find the manual entry of a program very difficult and boring. I want a micro offering software with simple home and business accounting programs, *not* games. What do you advise, since I am prepared to sell my Vic-20?

K F Searle,
Watford.

FIRST OF ALL, be prepared for a grave disappointment if you try to sell your Vic-20. The money you would get for it will be very, very little compared to what you paid for it. You do not mention how much you wish to spend on a computer which makes giving you specific advice fairly difficult. I imagine that a computer which allows use of discs, rather than a cassette recorder would be easier to use and therefore suggest you could consider a BBC Micro with discs. This, however, is not cheap.

Before you do anything, I would suggest you look through the advertisements in this issue of *Your Computer* and call a Commodore dealer, describe your software requirements, and see if you can get anything suitable for your Vic-20.

TAPE TO DISC

■ I have recently purchased a Cumana disc drive for my BBC Micro, and would like to save programs on disc from tape — Basic and machine code. I have little knowledge of machine code and assembler. Could you tell me how it could be done?

P A Jamison,
Virginia Water,
Surrey.

MANY PEOPLE, including myself, would love to know how to do this. However, we dare not risk the wrath — and the lawyers — from Acorn. One magazine printed a routine for busting the locks on cassette software from Acornsoft, so it could be transferred to disc, and got hit with a £70,000 fine for their trouble.

PRINTER ADVICE

■ Can you advise of a printer with a superior width of presentation to the ZX printer?

J A Jones,
10 Shalbourne Rise,
Camberley,
Surrey.

THERE ARE a number of interfaces now available to allow you to hook a "real" printer to your Spectrum. However, as far as I know, they do not offer a "superior width". However, I have printed your address in full so any manufacturer who thinks he can help can get in touch with you directly.

In an earlier issue of *Your Computer*, I gave a way of adding a line numbered zero to a Spectrum program. Mike O'Donnell of Palacefields, Runcorn, Cheshire, has sent me a method of adding line zero which he says has two advantages. One, it is easier than the method I outlined, and two, it *can* be removed. Here's Mike routine:

First enter your line number, as 1 REM . . .
Next POKE 23756,0
Press Enter then List

To remove the line:
POKE 23756,1
Press Enter and List

Thanks for this routine, Mike, which I note you acknowledge as having been shown to you at your local computer club. I agree that it is simpler than my method, but the very fact that it *can* be removed makes its inclusion rather pointless. I was trying to give a way to put a copyright notice within a program which could *not* be removed.

POWER UP!



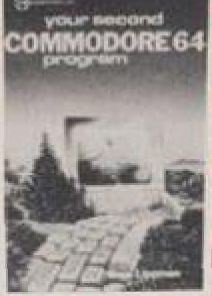
Your First Commodore 64 Program

R. Zaks £7.95

You can learn to write simple programs without any prior knowledge of mathematics or computers! Guided by colorful illustrations and step-by-step instructions, you'll be constructing programs within an hour or two.

ISBN: 0-89588-172-1, 7"x11", 182 pp, illustrated

also available for VIC-20, APPLE II, ATARI, IBM, TI99/4A



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G. Lippman £8.95

The many colorful illustrations in this book make it a delight for children and fun for adults who are mastering BASIC programming.
A sequal to **Your First Commodore 64 Program,** the book follows the same thorough, detailed approach and brings you to the next level of programming skill. With these BASIC language techniques, you'll soon be creating your own applications!

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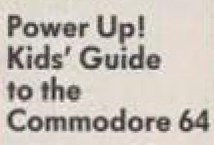


ATARI BASIC Programs in Minutes

St. R. Trost £8.95

You can use this practical set of programs without any prior knowledge of BASIC! Application examples are taken from a wide variety of fields, including business, home management, and real estate. Just type them in and they're ready to run!

ISBN: 0-89588-143-8, 6"x9", 170 pp, illustrated



Power Up! Kids' Guide to the Commodore 64

M. DeJonghe/C. Earhart £7.95

Colorful illustrations and a friendly robot highlight this guide to the Commodore 64 for kids 8-11.
The hands-on approach features short, easy lessons, and the spiral binding makes it ideal for use right at the computer. The engaging exercises are full of surprises and discoveries. By the end of the book, kids will be programming their own guessing games, "all-purpose" thank-you notes, multi-colored pictures, and simple animation. The authors are elementary school teachers with several years of computer experience.

ISBN: 0-89588-188-8, 9"x7", 192 pp, illustrated



Graphics Guide to the Commodore 64

Charles Platt £9.95

This easy-to-understand book is the first to answer the need for a Commodore-specific graphics guide. It will appeal to anyone who wants to master the Commodore 64's powerful graphics features. You'll learn to move images across the screen, built your own character sets, and create impressive headlines and detailed pictures on the screen. A full color collection of screen displays is included, as well as instructions on how to create your own video games.

ISBN: 0-89588-138-1, 7"x9", 261 pp, illustrated

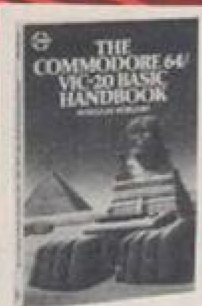


Programming the 6809

Zaks/Labiak £11.95

Get more out of your 6809 microprocessor – this book is chock full of programming tricks to show you how. Start with the basics of assembly language programming, and go on to understand registers and buses, subroutines, the 6809 instruction set, addressing modes, I/O trechniques and devices, data structures, and useful applications. Give your 6809 processor 16-bit performance with 8-bit economy. No prior programming knowledge is required.

ISBN: 0-89588-078-4, 6"x9", 362 pp, illustrated



The Commodore 64/VIC-20 BASIC Handbook

D. Hergert £9.95

In this dictionary-style handbook, you'll find clear descriptions and examples of each word in the Commodore 64/VIC-20 BASIC vocabulary.
The proper syntax of every keyword and function is explained carefully and thoroughly in easy-to-understand English. Short example programs illustrate the correct use of each command, and special notes provide insight into subtleties and extra features of Commodore 64/VIC-20 BASIC.

ISBN: 0-89588-116-0, 6"x9", 185 pp, illustrated

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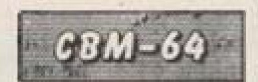


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Karate!

Alexis and Mario Chiotis, Finchley, London N12.



KARATE IS A two-player game based on the Japanese form of martial art, for the Commodore 64.

Using the multicolour sprite facility on the 64, we have created many of the elements of the real thing for example punching, kicking etc., without the pain. To play you will need two joysticks and quite a bit of skill.

When the program is run you will be allowed to choose the colour of your Karate suit. This is done using F1 and F3. To continue, press F7. You will then be asked how long the fight will last, and also the names of the players.

The next scene is where the fighting takes place. The two men stand on their lines, bow, and are then ready to fight. By using the combination of joystick movements, shown on the chart, some complicated and exciting fights can be achieved.

After a little practice, you will soon master these techniques and produce some startling effects.

Finally, the winner will be displayed showing off his skills by attacking a brick wall.

If you would like a copy of Karate, just send £3.50 including post and packaging to: Karate Offer, 7 Torrington Grove, Finchley, London N12 9NA.

Joystick port one (controls player 2).
North: Jumps in the air and kicks.
North-west: Does a high kick towards opponent's chest.
West: Moves player two forward.
Fire: Kicks towards opponent's stomach.
West and Fire: Blocks oncoming punches and high kicks.
South-West: Sweeps opponent's legs away.
South: Ducks. Can also be used to pull opponent's legs away.
East: Steps back.
East and Fire: Punches.

Joystick Port two (controls player 1).
North: Jumps and does a high kick.
North-east: Does a high kick towards opponent's chest.
East: Moves player 1 forward.
East and Fire: Blocks oncoming punches and high kicks.
South-east: Sweeps opponent's legs away.
South: Ducks. Can also be used to pull opponent's legs away.
West: Steps back.
West and Fire: Punches.

Variables.
C1: Colour of player one's karate suit.
C2: Colour of player two's karate suit.
J1: Peek of joystick port one.
J2: Peek of joystick port two.
P1: Player 1 score.
P2: Player 2 score.
S1: Sprite 1, i.e., 2040.
S2: Sprite 2, i.e., 2041.
T$: Time.

```
1 GOSUB1000
2 CLR:C1=1:C2=1:PRINT"[illegible]":GOSUB1500:GOSUB1520
3 GOSUB2000
4 GOSUB1000
10 POKE2040,192:POKE2041,193
12 POKE53248,112:POKE53250,212
13 POKE2040,214:POKE2041,213
14 FORT=1TO500:NEXT:O=PEEK(53278)
15 POKE2040,192:POKE2041,193
20 J1=PEEK(56321):J2=PEEK(56320):PRINT"[illegible]"TAB(9)P1TAB(27)P2
21 T$=MID$(TI$,3,2)+":"+RIGHT$(TI$,2):PRINT"[illegible]"TAB(17)T$:GOSUB3000
22 IFJ2<>103THEN24
23 POKE2040,209
24 IFJ1<>235THEN40
26 POKE2041,208
40 IFJ1<>255THEN60
42 POKE2041,193
60 IFJ2<>127THEN80
61 POKE2040,192
80 IFJ1<>239THEN100
82 POKE2041,199
100 IFJ2<>111THEN120
102 POKE2040,198
120 IFJ1<>231THEN140
122 POKE2041,196
140 IFJ2<>107THEN160
142 POKE2040,197
160 IFJ2<>119THEN180
164 IFPEEK(53248)>250THEN180
166 IFPEEK(53278)<>115THENPOKE53248,PEEK(53248)+5
180 IFJ2<>123THEN200
182 POKE2040,206
184 IFPEEK(53248)<30THEN200
186 POKE53248,PEEK(53248)-5
200 IFJ1<>250THEN220
202 POKE2041,203
220 IFJ2<>118THEN240
222 POKE2040,202
240 IFJ1<>249THEN260
244 POKE2041,205
260 IFJ2<>117THEN280
262 POKE2040,204
280 IFJ1<>254THEN305
282 POKE53251,PEEK(53251)-25
284 POKE2041,201:FORT=1TO20:NEXT:POKE2041,199
286 FORT=0TO400:NEXT
305 IFJ2<>126THEN320
307 POKE53249,PEEK(53249)-25
309 POKE2040,200:FORT=1TO20:NEXT:POKE2040,198
311 FORT=1TO400:NEXT
320 IFJ1<>253THEN340
324 POKE2041,201
340 IFJ2<>125THEN360
342 POKE2040,200
360 IFJ1<>247THEN380
362 POKE2041,207
363 IFPEEK(53250)>249THEN380
364 POKE53250,PEEK(53250)+5
380 POKE2041,193
390 IFJ1<>251THEN400
392 IFPEEK(53250)<30THEN400
394 IFPEEK(53278)<>115THENPOKE53250,PEEK(53250)-5
398 POKE2040,192
400 IFPEEK(53278)=115THEN500
401 POKE53249,185:POKE53251,185
402 POKE2040,192:POKE2041,193
404 GOTO20
500 S=54272:FORL=0TO24:POKEL+S,0:NEXT:POKES+0,240:POKES+1,33
502 POKES+5,7:POKES+22,104:POKES+23,4:POKES+24,15
503 POKES+4,129:FORT=1TO200:NEXT:POKES+24,0
508 POKE53249,185:POKE53251,185
509 S1=PEEK(2040):S2=PEEK(2041):O=PEEK(53278)
510 IFS1=192ANDS2=193THEN20
511 IF(S2=208ANDS1=202)OR(S1=209ANDS2=203)THEN20
512 IF(S1=192ANDS2=207)OR(S2=193ANDS1=206)THEN20
513 IF(S2=208ANDS1=192)OR(S2=193ANDS1=209)THEN20
514 S3=S2-1:IFS1=S3THEN20
515 IFS1=202ANDS2=201THEN20
516 IFS1=200ANDS2=203THEN20
517 IFS1=198ANDS2=205THEN600
518 IFS1=204ANDS2=199THEN650
520 IFS1<>192ANDS2<>197THEN526
525 GOTO650
526 IFS1<>192ANDS2<>199THEN530
527 GOTO650
530 IFS1<>192ANDS2<>202THEN540
535 GOTO650
540 IFS1<>192ANDS2<>205THEN550
545 GOTO650
550 IFS2<>193ANDS1<>198THEN560
555 GOTO680
560 IFS2<>193ANDS1<>196THEN570
565 GOTO680
570 IFS2<>193ANDS1<>203THEN580
575 GOTO680
580 IFS2<>193ANDS1<>204THEN590
585 GOTO680
590 IF(S1<>198ANDS2<>197)OR(S1<>199ANDS2<>201)THEN600
595 GOTO650
600 IF(S2<>199ANDS1<>196)OR(S2<>199ANDS1<>200)THEN610
605 GOTO680
610 IF(S1<>202ANDS2<>197)THEN620
615 GOTO680
620 IFS2<>203ANDS1<>196THENGOTO20
625 GOTO650
650 IFPEEK(53248)<49THEN656
654 POKE53248,PEEK(53248)-10
655 O$=TI$
656 POKE2040,211:POKE2041,212
660 FORT=1TO1500:NEXT
662 P2=P2+1
664 TI$=O$:GOTO10
680 IFPEEK(53250)>240THEN686
684 POKE53250,PEEK(53250)+10
685 O$=TI$
686 POKE2040,212:POKE2041,210
687 FORT=1TO1500:NEXT
689 P1=P1+1
690 TI$=O$:GOTO10
1000 PRINT"[illegible]":POKE214,14
1010 PRINT:PRINTTAB(17)"[illegible]"
1020 PRINT"[illegible]"
1022 PRINT"[illegible]"
1024 PRINT"[illegible]"
1026 PRINT"[illegible]"
1028 PRINT"[illegible]"
1030 PRINT"[illegible]"
1040 GOSUB1500
1041 PRINT"[illegible]"
1050 TI$="000000":RETURN
1500 PRINTCHR$(8):POKE53280,6:POKE53281,6
1510 PRINT"[illegible]"
1511 PRINT"[illegible]"
1512 PRINT"[illegible]"
1513 PRINT"[illegible]"
1514 PRINT"[illegible]"
1515 PRINT"[illegible]":RETURN
1520 PRINT"[illegible]CHOOSE YOUR COLOURS"
1522 PRINT"[illegible]USING 'F1' & 'F3'"
1523 PRINT"[illegible]PRESS 'F7' TO START"
1530 POKE2040,192:POKE2041,193:POKE53276,3
1531 POKE53271,3:POKE53277,3
1532 POKE53285,0:POKE53286,10
1535 POKE53248,100:POKE53249,130:POKE53250,200:POKE53251,130:POKE53269,3
1599 POKE53287,C1:POKE53288,C2
1600 GETA$:IFA$=""THEN1600
1605 IFA$="[illegible]"THENC1=C1+1
1610 IFA$="[illegible]"THENC2=C2+1
1615 IFC1>15THENC1=0
1620 IFC2>15THENC2=0
1621 IFC1=2ORC1=8ORC1=6ORC1=4ORC1=10THENC1=C1+1
1622 IFC2=2ORC2=8ORC2=6ORC2=4ORC2=10THENC2=C2+1
1625 POKE53287,C1:POKE53288,C2
1630 IFA$="[illegible]"THEN6000
1635 GOTO1600
2000 PRINT"[illegible]":POKE53248,112:POKE53249,185:POKE53250,212:POKE53251,185
2002 POKE53271,15:POKE53277,3
2003 POKE53269,255:POKE53276,255:POKE53285,0:POKE53286,10
2004 POKE2042,194:POKE2043,195
2006 POKE53289,1:POKE53290,1
2007 POKE53264,0
2008 POKE53252,39:POKE53253,140:POKE53254,40:POKE53255,140
2009 POKE2047,215:POKE53294,14:POKE53262,177:POKE53263,155
2500 RETURN
3000 IFVAL(MID$(TI$,3,2))=>AANDP1<>P2THENPOKE53269,0:GOTO5000
3010 IFVAL(MID$(TI$,3,2))=>5THENPOKE53269,0:GOTO5000
3020 RETURN
5000 POKE214,10:PRINT:PRINTTAB(10)"OOPS! THE TIME IS UP.":FORI=1TO1500:NEXT
5005 PRINT"[illegible]":POKE214,0:PRINT:PRINTTAB(27)"[illegible]"
5010 PRINT"[illegible]"TAB(4)"THE WINNER WAS :"
5020 PRINT"[illegible]"TAB(8);
5030 IFP1>P2THENPRINTNA$(1)
5040 IFP2>P1THENPRINTNA$(2)
5050 GOSUB1500:POKE53248,192:POKE53249,120:POKE53269,1:POKE2040,192
5055 FORI=0TO400:NEXT
5060 POKE2040,192:PRINT"[illegible]      PRESS SPACE BAR TO RESTART."
5070 A$="":GETA$:IFA$<>" "THEN5090
5080 POKE53269,0:RUN2
5090 FORI=0TO400:NEXT:PRINT"[illegible]"
5095 POKE2040,202:GOTO5055
6000 POKE53269,0:PRINT"[illegible]     ENTER FIGHTING TIME LIMIT[illegible]"
6001 PRINTTAB(8)"USING KEYBOARD NUMBERS"
6005 PRINTTAB(12)"[illegible]MAX. 5 MINUTES[illegible]"
6010 A$="":GETA$:IFA$=""THEN6010
6020 A=ASC(A$)
6030 IFA>=49ANDA<=53THENA=VAL(A$):GOTO6100
6040 GOTO6010
6100 PRINTA:OPEN1,0:PRINT"[illegible]ENTER YOUR NAME PLAYER ONE :";
6110 INPUT#1,NA$(1)
6120 PRINT:PRINT"[illegible]ENTER YOUR NAME PLAYER TWO :";
```

(continued on next page)

(continued from previous page)

```
6130 INPUT#1,HA$(2)
6140 CLOSE1 RETURN
10000 DR12298 FOR I=0TO22 FORI=0TO2 READA POKE8+I,A NEXTI D=D+64 NEXTI
10010 RETURN
11010 DATA0,94,0,0,124,0,0,115,0,0,124,0,0,47,0,0,160,0,0,171,0,0,194,0,0
11012 DATA172,0,0,171,192,0,169,0,0,95,0,0,160,0,0,160,0,0,160,0,0,160,0,0
11014 DATA160,0,0,160,0,0,175,0,0,160,0,0,252,0
11019 DATA0,21,0,0,61,0,0,205,0,0,61,0,0,12,0,0,10,0,0,234,0,0,46,0,0,34,0,2
11020 DATA234,0,0,42,0,0,85,0,0,42,0,0,42,0,0,42,0,0,42,0,0,42,0,0,42,0
11022 DATA250,0,0,10,0,0,63,0
11027 DATA160,0,0,47,252,0,44,12,0,47,204,0,47,60,0,44,204,0,47,252,0
11029 DATA44,204,0,44,204,0,47,60,0,47,204,0,47,252
11031 DATA0,32,0,0,32,0,0,32,0,0,32,0,0,32,0,0,32,0,0,32,0,0,32,0
11034 DATA0,0,10,0,63,249,0,48,56,0,60,240,0,51,56,0,51,56,0,63,240,0,51,240
11036 DATA0,49,56,0,51,56,0,51,56,0,63,240,0,0,0,0,0,0,0,0,0,0,0
11038 DATA0,0,0,0,0,0,0,0,0,0,0,0
11041 DATA 0,21,0,0,61,0,0,205,0,0,61,0,0,12,0,0,10,0,255,170,0,40,46
11042 DATA 0,0,46,0,3,250,0,0,42,0,0,95,0,0,42,0,0,42,0,0,42,0,0,42,0,0
11043 DATA 42,0,0,42,0,0,250,0,0,10,0,0,63,0
11045 DATA 0,94,0,0,124,0,0,115,0,0,124,0,0,47,0,0,160,0,0,170,255,0
11046 DATA 194,12,0,194,0,0,175,192,0,160,0,0,95,0,0,160,0,0,160,0,0,160,0,0
11047 DATA 169,0,0,160,0,0,160,0,0,175,0,0,160,0,0,252,0
11049 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,90,240,0
11050 DATA 106,170,0,106,164,0,170,154,131,42,106,171,1,160,0,0,160,0,0
11051 DATA 160,0,0,160,0,0,160,0,0,160,0,0,240,0
11054 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,15,165
11055 DATA 0,27,169,0,38,169,194,169,170,234,170,104,0,10,129,0,2,128
11056 DATA 0,2,128,0,2,128,0,2,128,0,2,128,0,3,192
11058 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
11059 DATA 0,0,0,0,0,0,0,0,1,64,0,9,192,0,40,0,0,171,0,0,84,192,0,168,0,0
11060 DATA 40,0,0,160,0,0,252,0
11063 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
11064 DATA 0,0,0,0,0,0,0,1,64,0,3,96,0,0,40,0,0,234,0,3,21,0,0,42,0,0
11065 DATA 40,0,0,10,0,0,63,0
11067 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,3,0,0,11,0,0,43,90
11068 DATA 240,160,106,170,160,106,164,128,170,154,0,42,104,0,1,160,0,0
11069 DATA 160,0,0,160,0,0,160,0,0,160,0,0,160,0,0,240,0
11072 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,192,0,0,224,0,0,232,0,0
11073 DATA 42,15,165,10,142,169,2,154,169,0,166,170,0,41,168,0,10,64
11074 DATA 0,10,0,0,10,0,0,10,0,0,10,0,0,10,0,0,15,0
11077 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,5,0,0,13,128,0,37,160
11078 DATA 0,170,160,0,170,174,0,138,190,64,129,169,128,32,22,129,12,10
11079 DATA 128,0,40,160,0,160,40,0,160,11,0,128,3,3,192,0
11082 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,80,0,2,112,0,10
11083 DATA 80,0,42,170,0,106,170,1,190,162,2,106,2,2,140,10,2,160,40,10
11084 DATA 40,0,40,10,0,224,10,0,192,2,0,0,3,192
11087 DATA 0,94,0,0,124,0,0,115,0,0,124,0,0,45,0,0,160,0,0,171,0,0,160,0,0
11088 DATA 104,0,0,175,192,0,160,0,0,95,0,0,160,0,0,160,0,0,136,0,2
11089 DATA 136,0,10,0,0,56,0,0,48,15,0,48,0,0,0,0,0
11092 DATA 0,21,0,0,61,0,0,205,0,0,61,0,0,12,0,0,10,0,0,234,0,0,42,0,0
11093 DATA 46,0,3,250,0,0,42,0,0,85,0,0,42,0,0,42,0,0,42,0,0,34,128
11094 DATA 0,32,160,0,32,44,0,240,12,0,0,12,0,0,0
11097 DATA 0,21,0,0,61,0,0,205,0,0,61,0,0,12,0,3,10,0,3,234,0,0,42,0,12,46,0
11098 DATA 15,250,0,0,42,0,0,85,0,0,42,0,0,42,0,0,42,0,0,34,128,0,32
11099 DATA 160,0,32,44,0,240,12,0,0,12,0,0,0
11102 DATA 0,94,0,0,124,0,0,115,0,0,124,0,0,40,0,0,160,192,0,171
11103 DATA 192,0,160,0,0,104,48,0,175,240,0,160,0,0,95,0,0,160,0,0,160,0,0
11104 DATA 136,0,2,136,0,10,0,0,56,0,0,48,15,0,48,0,0,0,0,0
11107 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
11108 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2,128,17,10,160,5
11109 DATA 40,42,165,240,15,170
11112 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
11113 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,112,2,128,80,10,160,90
11114 DATA 160,40,170,240,15
11118 DATA 0,0,0,192,44,12,192,116,12,128,204,0,32,40,32,10,170,128
11119 DATA 2,170,0,0,160,0,0,160,0,0,160,0,0,84,0,0,160,0,0,160,0,0
11120 DATA 136,0,0,136,0,0,136,0,0,136,0,0,136,0,0,136,0,0,136,0,0,204,0
11124 DATA 0,0,0,0,0,0,0,0,0,0,21,0,0,205,0,0,61,0,0,2,128,0,2,160,0,3,232
11125 DATA 0,0,106,0,0,46,128,0,21,64,0,10,128,0,10,128,0,10,128,0,10,128,0,10
11126 DATA 128,0,10,128,0,62,128,0,2,128,0,15,192
11129 DATA 0,0,0,0,0,0,0,0,0,0,0,0,84,0,0,115,0,0,124,0,2,128,0,10,128,0
11130 DATA 47,192,0,174,0,2,104,0,1,84,0,2,160,0,2,160,0,2,160,0,2,160
11131 DATA 0,2,160,0,2,160,0,2,188,0,2,128,0,3,240,0
11132 DATA5,85,64,5,85,64,7
11133 DATA255,64,7,51,64,7,255
11134 DATA64,7,3,64,3,255,0
11135 DATA0,252,0,2,170,0,10
11136 DATA170,128,42,130,160,42,170
11137 DATA160,42,130,160,42,170,160
11138 DATA254,130,252,254,170,252,0
11139 DATA0,0,0,0,0,0
11140 DATA0,0,0,0,0,0
```

Painter

Barry O'Reilly,
Kells,
County Meath,
Ireland.



HAVING JUST GRADUATED from college with an arts degree you find the permissive world totally engrossed in watching junior blasting the bug-eyed-bouncers before they eat his cat and kill his grandmother, or vice versa. There seems no place for conscientious objectors like you, so despondently you don the disguise of an inconspicuous paint-brush and venture out to make your fortune in the menial post of exterior decorator.

For those of you who have never had the experience of being a paint-brush I shall try to describe the feeling. You are situated on the wall of a house and may move anywhere you wish, painting as you go. Inevitably there are a collection of hazards to be avoided and, equally inevitably, bonuses to be collected.

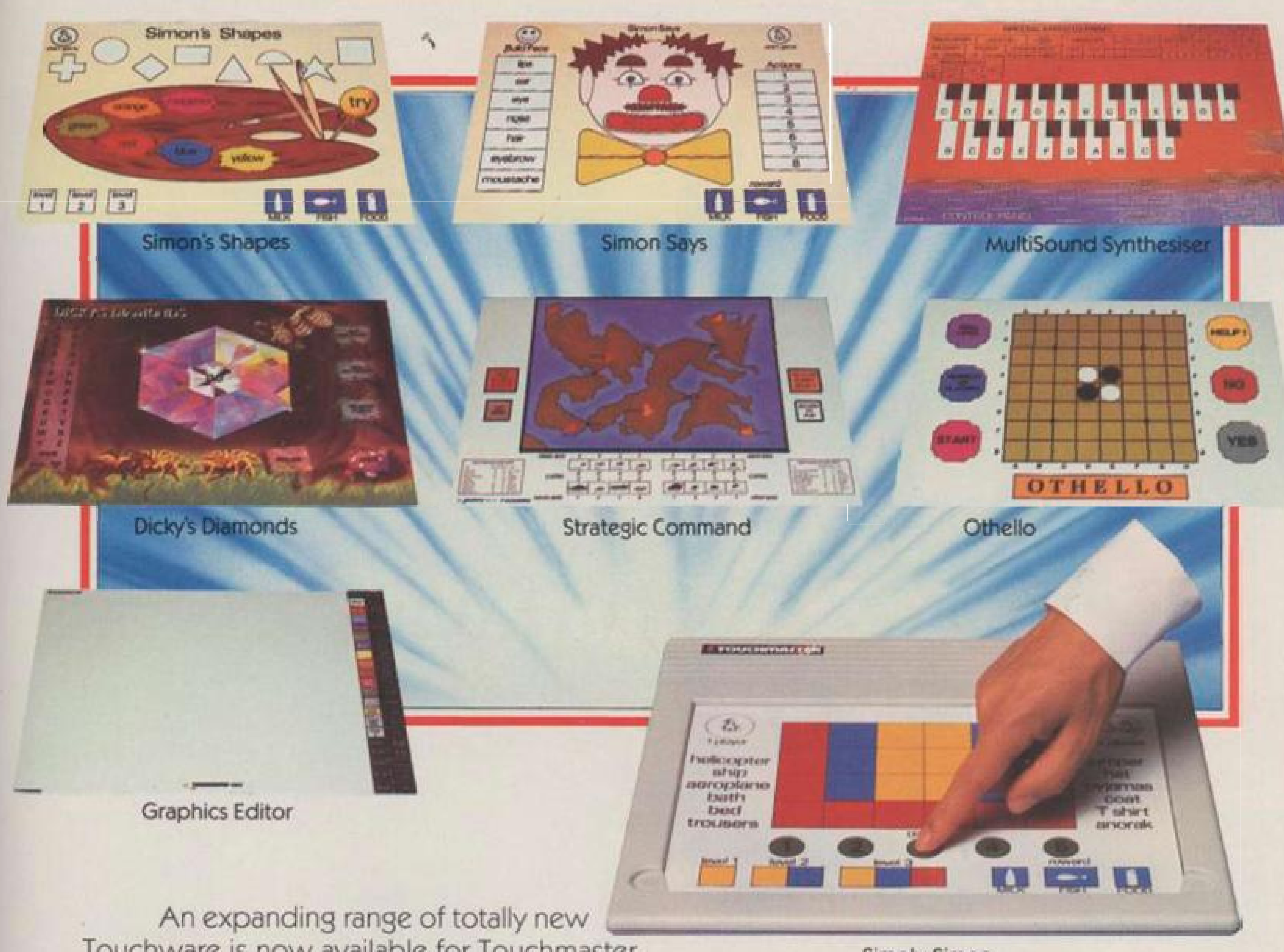
Death can also be found in the form of a dry paint brush. To avoid this, paint-pots are placed about the wall, running over these will replenish the linear scale at the bottom of the screen. About one minute of diligent swishing is enough to complete a wall and then be prepared for . . . Oh it's all in the program anyhow.

Key in the program as listed even though the numbering appears unbearably erratic. Then save it under your favourite file name using the suffix Line 8000 so as to display the instructions on loading.

```
   1
  10 DEF FN r(r)=INT (RND*r)+1
  20 LET h=500
  90 GO TO 1e3
 200 LET s=s+1: PRINT AT 0,0; PA
PER 1; INK 6;"WAGES £";s: LET p=
p+1: LET paint=paint-paint*(p>=w
): RETURN
 300 GO TO 600
 400 RETURN
 600 LET paint=0: RETURN
 700 LET paint=30: PRINT PAPER 1
; INK 1;AT 21,0;"[redacted]": RETURN
 900 GO TO 600
1000 LET d=0: LET s=d: LET l=3
1100 LET p=0
1200 BRIGHT p: OVER p: INVERSE p
: FLASH p: BORDER 2: PAPER p: IN
K 2: CLS : LET d=d+1
1210 FOR n=21 TO 1 STEP -1: PRIN
T AT n,1;"EEEEEEEEEEEEEEEEEEEEEE
EEEEEEEE";AT n,p; INK 6; PAPER 1
;" ";AT n,31;" ": NEXT n
1230 FOR n=1 TO d*3+5: PRINT INK
 6;AT FN r(19),FN r(29);"F"; INK
 5;AT FN r(19),FN r(29);"G": BEE
P .005,d+12: NEXT n
1235 LET w=400-10*d
1240 FOR n=0 TO 18: PRINT AT FN
r(19),FN r(29); INK 7;"L"; BRIGH
T 1; INK 7;AT FN r(19),FN r(29);
"M" AND n<10: BEEP .03,-12: NEXT
 n
1250 LET wx=FN r(5)+3: FOR n=1 T
O d: LET wy=FN r(28): PRINT INK
6; PAPER 0;AT wx,wy;"HI";AT wx+1
,wy;"JK": BEEP .1,7: NEXT n
1255 PAPER 1: INK 6: FOR n=0 TO
31: PRINT AT 0,n;" ": NEXT n: PR
INT AT 0,0;"WAGES £";s;TAB 12;"B
"( TO l-1),"BEST PAY £";h: PAPE
R 0: GO SUB 700
1260 PRINT PAPER 1; INK 6;AT 10,
13;"READY !": INK 4: PRINT "A"
1270 RESTORE : FOR n=0 TO 7: REA
D b: BEEP .2,b: NEXT n
1280 DATA 0,4,7,12,9,11,9,4
1290 FOR n=19 TO 13 STEP -1: PRI
NT AT 10,n;"A": INK 1; BRIGHT 1;
"■": BEEP .01,4: NEXT n
1300 LET dx=0: LET dy=-1: LET x=
10: LET y=13: GO TO 2e3
1400 LET x=x-dx: LET y=y-dy: GO
TO 300
2000 LET dx1=dx: LET dy1=dy: LET
 dx=(INKEY$="6")-(INKEY$="5"): L
ET dy=(INKEY$="4")-(INKEY$="3")
AND NOT dx: IF NOT dx AND NOT dy
 THEN LET dx=dx1: LET dy=dy1
2010 LET b=(145-dx AND dx)+(145+
dy AND dy)
2020 PRINT AT x,y; BRIGHT 1; INK
 1;"■": LET x=x+dx: LET y=y+dy
2025 LET paint=paint-.5: PRINT A
T 21,paint; INK 3;"■"
2030 GO SUB ATTR (x,y)+100
2040 PRINT AT x,y;CHR$ b
2050 GO TO 2e3+700*(paint<.5)
2700 IF p>=w THEN PRINT BRIGHT 1
; FLASH 1; PAPER 6; INK 1;AT 10,
6;"WALL #";d;" COMPLETED !": FOR
 n=1 TO 10: FOR f=1 TO 6: BEEP .
01,n+f: NEXT f: NEXT n: PAUSE 40
0: GO TO 4e3
2800 LET l=l-1: INK 5: FOR n=0 T
O 3: PRINT AT x,y;CHR$ (144+n):
BEEP .3,-n*4: NEXT n: FOR n=x TO
 21: PRINT AT n,y;"D";AT n-1,y;
INK 1; BRIGHT 1;"■": BEEP .05,20
-n*2: NEXT n: PRINT AT 21,y; PAP
ER 1;" ": LET p=p+20-x
2900 IF l THEN GO SUB 700: FOR n
=0 TO 200: GO TO 1255
3000 RESTORE 3500: FOR n=0 TO 14
: READ x,y: BEEP x/8,y: NEXT n
3010 IF s>h THEN LET h=s: PRINT
AT 0,26; BRIGHT 1; FLASH 1;h
3015 LET s=1
3020 FOR n=7 OR s TO 7 AND s STE
P s-NOT s: PRINT AT 10,5; INK n;
"PRESS R TO PLAY AGAIN.";AT 11,1
1;"Q TO QUIT."
3030 IF INKEY$="q" THEN CLEAR
STOP
3040 IF INKEY$="r" THEN GO TO 1e
3
3050 PAUSE 3: NEXT n: PAUSE 50
LET s=NOT s: GO TO 3020
3500 DATA 2,0,1,4,8,7,2,0,1,4,8,
7,2,0,1,4,4,7,2,4,x,y,4,0,x,y,x,
y,8,-20
4000 BORDER 1: INK 1: PAPER 3: C
LS : PRINT '' INVERSE 1;TAB 10;"
BONUS STAGE";TAB 0
4010 PRINT AT 8,12; INK 6;"L"; I
NK 4;" = £50";AT 16,8; PAPER 0;
INK 2; FLASH 1;" PRESS ANY KEY "
4020 PAUSE 200: BORDER 2: PAPER
0: CLS
4030 FOR n=28 TO 228 STEP 40: PL
OT n,16: DRAW 0,143: NEXT n
4040 FOR n=28 TO 140 STEP 16
4050 GO TO 4060+10*(RND<.5)
4060 PLOT 28,n: DRAW 40,0: PLOT
108,n: DRAW 40,0: PLOT 188,n: DR
AW 40,0: GO TO 4080
4070 PLOT 68,n: DRAW 40,0: PLOT
148,n: DRAW 40,0
4080 NEXT n
4090 PRINT AT 20,INT (RND*6)*5+3
; INK 6;"L"
4100 LET y=3: LET x=1: INK 6
4110 FOR n=1 TO 5*RND+35: PRINT
AT x,y;"C": BEEP .08,7: IF INKEY
$<>"" THEN GO TO 4135
4120 PRINT AT x,y;" ": LET y=y+5
: IF y>28 THEN LET y=3
4130 NEXT n
4135 PAPER 1
4140 LET r5=POINT (y*8-8,(21-x)*
8+4): LET r8=POINT (y*8+8,(21-x)
*8+4): LET r6=POINT (y*8+4,(21-x
)*8-4)
4150 BEEP .005,x+y: PRINT AT x,y
; PAPER 1;" ": IF r5 AND r6 THEN
 LET dy=-1: LET c$="A"
4160 IF r6 AND r8 THEN LET dy=1:
 LET c$="C"
4170 IF r6 AND NOT r5 AND NOT r8
 THEN LET x=x+1: LET dy=0: LET c
$="D"
4180 LET y=y+dy: PRINT AT x,y;c$
: IF x<>19 THEN GO TO 4140
4200 PRINT AT x,y;" "
4210 IF ATTR (20,y)<>6 THEN GO T
O 4250
4220 PRINT AT 19,y; PAPER 1;" ";
 FLASH 1;AT 20,y; INK 6;"D";AT 2
1,14; INK 4;"250": LET s=s+50: F
OR n=10 TO 30: BEEP .005,n: NEXT
 n: FOR n=30 TO 0 STEP -1: BEEP
.01,n: NEXT n
4230 FLASH 0: FOR n=0 TO 8: FOR
w=144 TO 147: PRINT AT 20,y; INK
 6;CHR$ w: BEEP .01,n+(w-144): N
EXT w: NEXT n
4240 PAUSE 0: GO TO 1100
4250 PRINT AT 20,y;"D": BEEP .1,
3: BEEP .2,0: BEEP .3,-4: BEEP .
4,-9: BEEP .5,-12: GO TO 1100
6500 RETURN
7000 GO TO 600
7100 LET s=s+4: GO TO 200
8000 PAPER 0: INK 0: BORDER 2: C
LS
8010 PRINT INK 2;AT 1,11; FLASH
1;"▛▀▀▀▀▀▀▀▜";AT 2,11;"▌"; FLASH
 0;"PAINTER"; FLASH 1;"▐";AT 3,1
1;"▙▄▄▄▄▄▄▄▟"
8020 PRINT TAB 4; INK 1;"© 1984
Barry F.O'Reilly"
8030 FOR n=0 TO 31: PRINT INK 4;
"-";: NEXT n
8040 PRINT '" An unemployed Leo
nardo, your only hope of work
is at Mrs. Pritchetwood's red
brick house which she has deci
ded to coat with a sprightly b
lue paint."
8050 PRINT '" An easy job for o
ne of your calibre one would
think, but it's not quite so
simple."
8060 PRINT '" You must avoid al
```

(continued on page 181)

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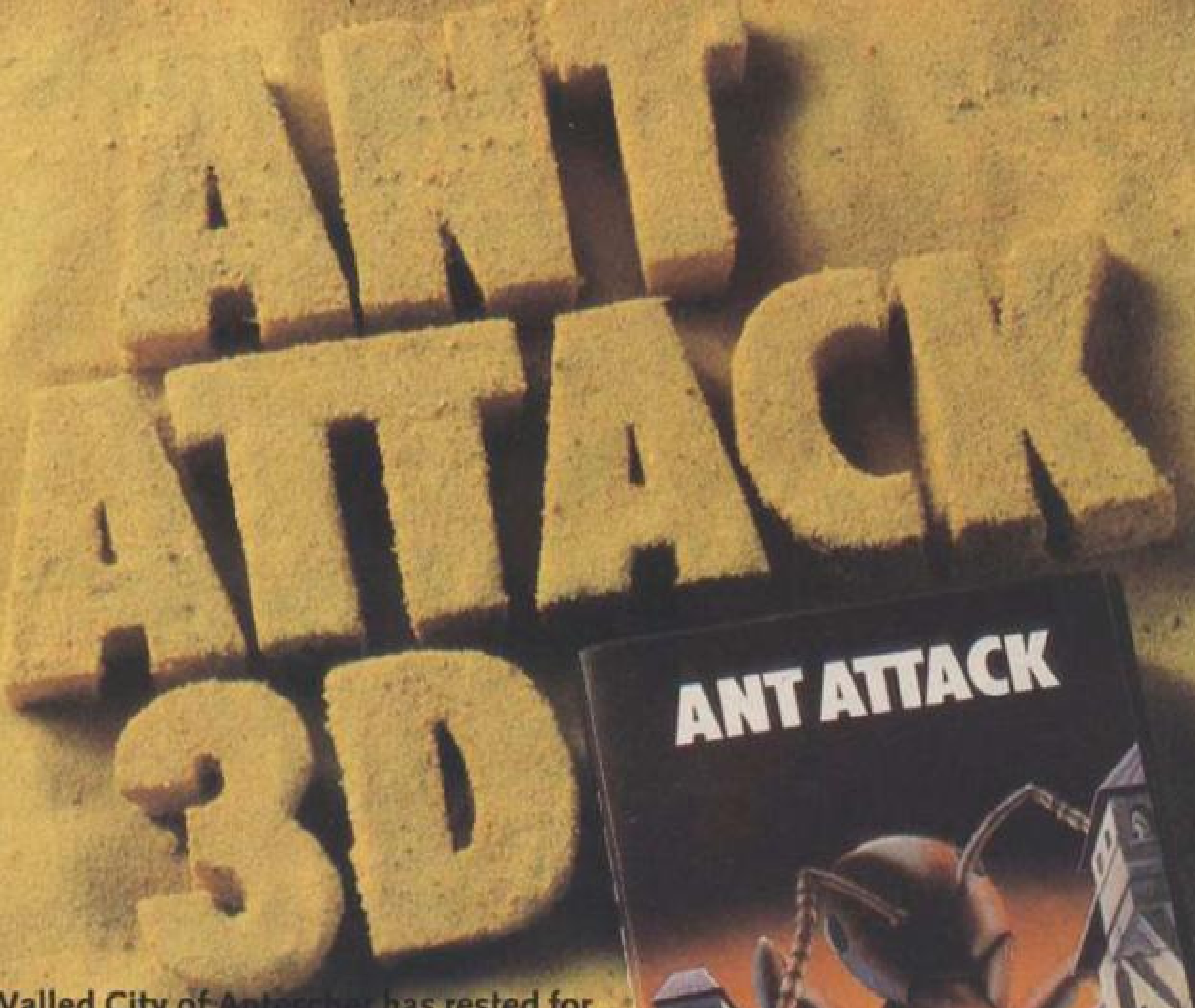
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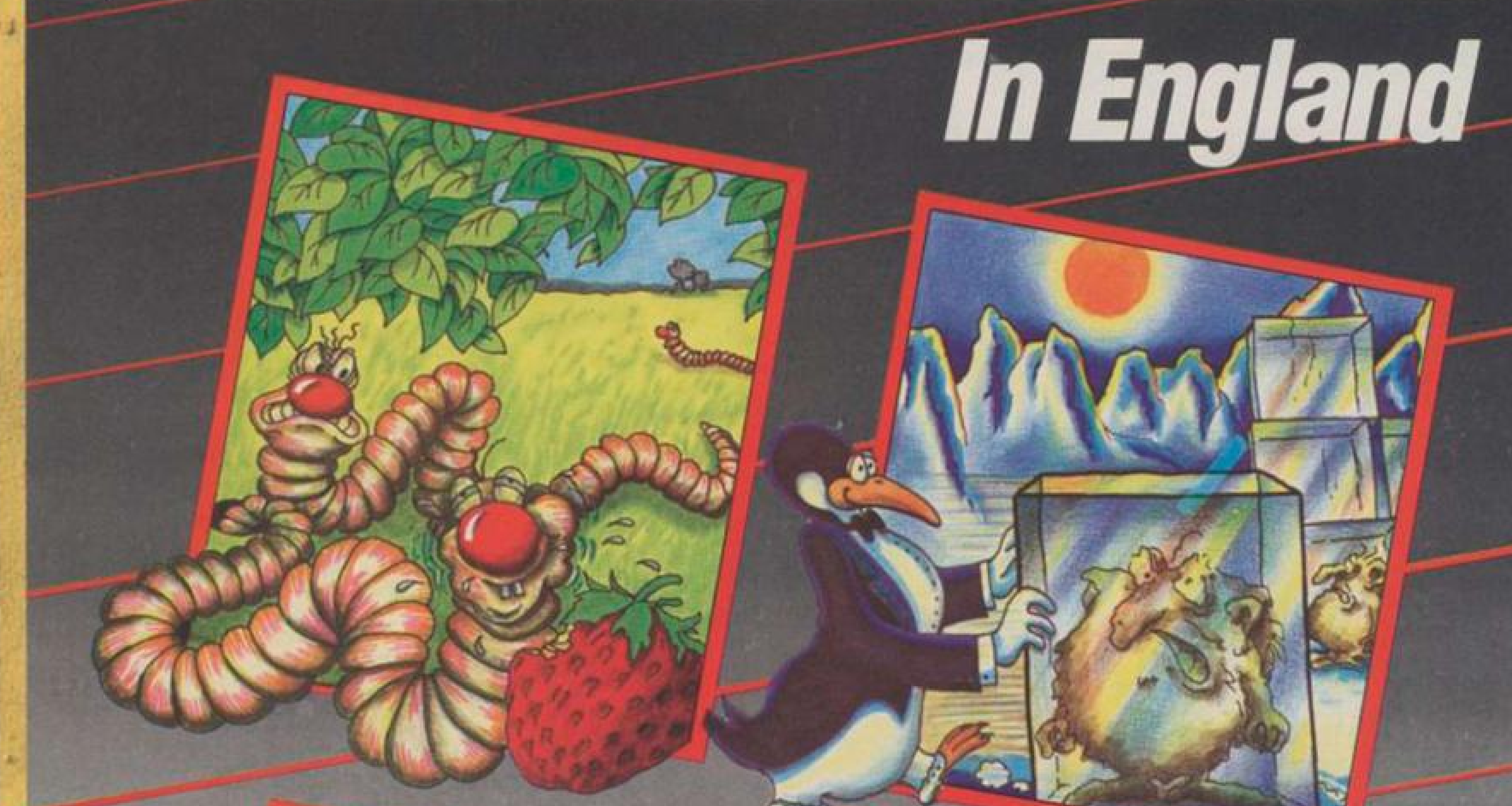
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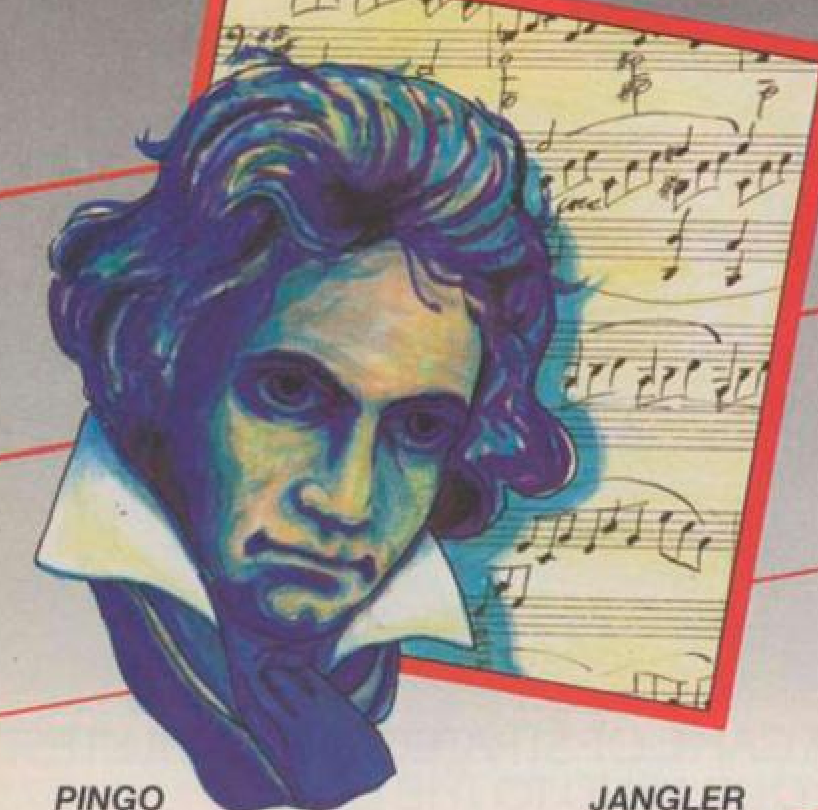
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(continued from page 176)

```
l that seek    to thwart your eff
orts: The      pestilent bees, th
e skulking     soap-bubbles and o
f course no    handiwork on dear
old Mrs.       Pritchetwood's win
dows."
8070 GO SUB 9500
8080 IF INKEY$<>"" THEN GO TO 80
90: REM Press any key.
8085 GO TO 8080
8090 PAPER 0: INK 0: FOR n=6 TO
21: PRINT AT n,1; PAPER 0;"
                          ": NEXT
 n
8100 PRINT AT 6,1;" The kind old
 lady offers £1    for each squa
re and £5 if you   manage to cov
er a crack."
8110 PRINT '" Extra cash can be
 earned at     the bonus stage by
 reaching      the gold paint pot
."
8120 PRINT '" Collecting paint
pots will      replenish your bru
sh during      the game, but be t
hrifty,        the supply is limi
ted."
8130 PRINT '" Fingers ready: 3-
LEFT 4-RIGHT"'TAB 17;"8-UP   U-D
OWN"
8140 GO SUB 9500
8500 RESTORE 9e3: FOR n=USR "a"
TO USR "n"
8510 READ s: POKE n,s: NEXT n
8520 PAUSE 0: RUN
9000 DATA 96,176,112,191,127,176
,112,160
9010 DATA 170,85,-1,126,24,s,s,s
9020 DATA 5,14,13,-2,-3,14,13,6
9030 DATA 24,s,s,s,126,-1,170,85
9040 DATA 127,s,s,0,-9,s,s,0
9050 DATA 36,24,219,-1,198,126,6
6,189
9060 DATA 32,82,37,2,32,82,37,2
9070 DATA -1,127,97,s,s,127,s,97
9080 DATA -1,-2,134,s,s,-2,s,134
9090 DATA 97,s,s,s,s,s,127,-1
9100 DATA 134,s,s,s,s,s,-2,-1
9110 DATA 60,66,126,70,90,70,94,
126
9120 DATA 96,60,168,36,82,136,14
8,35,s
9140 DATA 6,13,14,-3,-2,13,14,5
9500 FLASH 1: INK 7: PRINT AT 0,
0;"
"'#1; FLASH 1;AT 0,0; PAPER 0
;"
"; FOR n=1 TO 21: PRINT AT n,0
;" ";AT n,31;" ": NEXT n: FLASH
0
9510 IF INKEY$<>"" THEN GO TO 95
10
9520 FOR n=22721 TO 23231: IF n/
32<>INT (n/32) AND (n+1)/32<>INT
 ((n+1)/32) THEN POKE n,135: BEE
P .001,30: POKE n,6
9530 IF INKEY$<>"" THEN RETURN :
 REM Dismiss instructions by
     pressing any key
9540 NEXT n
9550 RETURN
```

Chicks

Stuart Smalley,
Selby,
North Yorkshire.

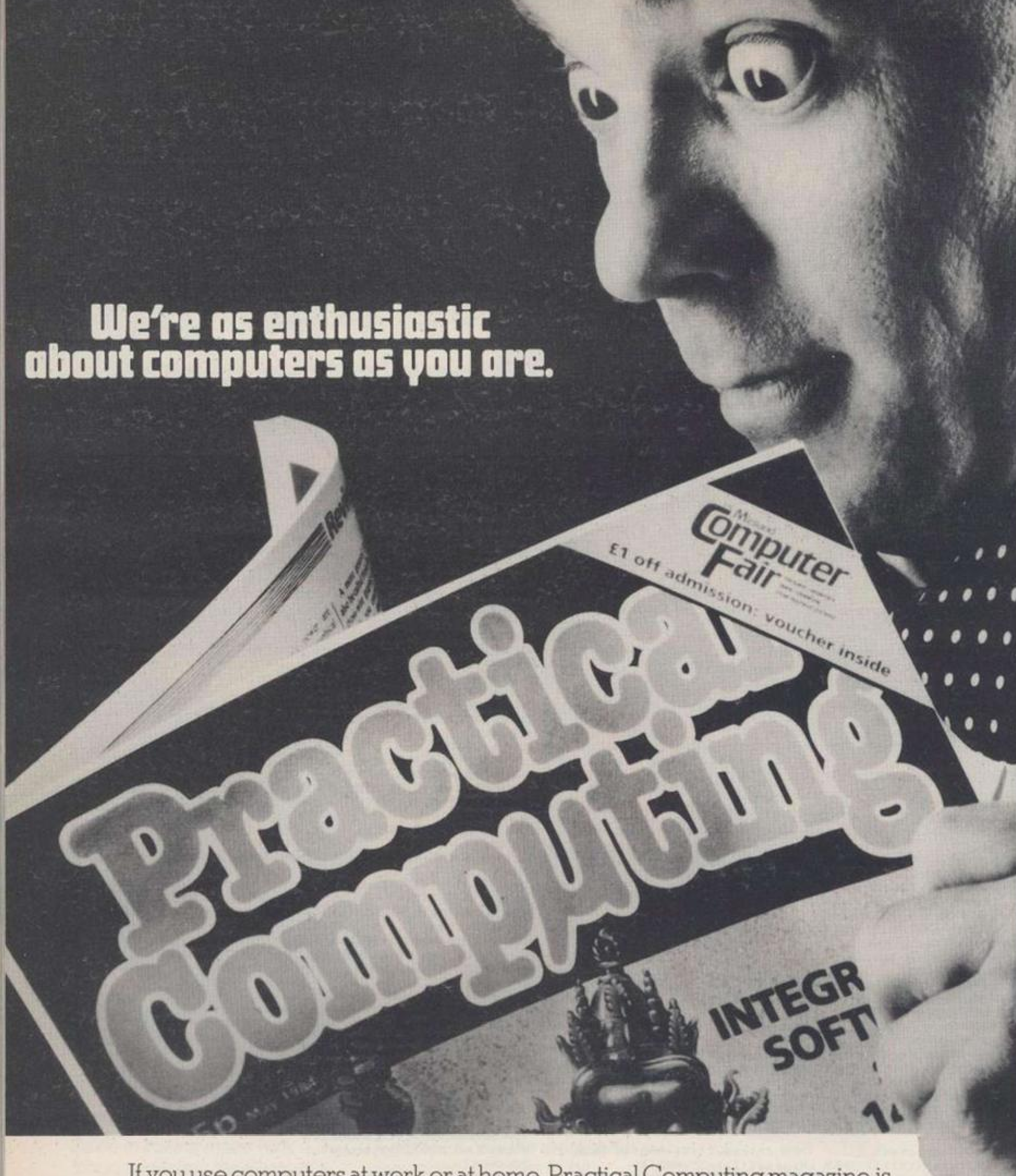


CHICKS IS FOR a model B BBC computer and involves directing a man about the screen by the use of the Z, X — left, right — and, : ; / for up, down. The idea is to herd a flock of chicks into a chicken coop. The chicks always move away from the man but the man has moves at three times their speed.

The game can be speeded up by changing the multipland on line 140 or even by deleting the whole line.

```
10REM (C) STUART SMALLEY.1984
20S%=0
30DIM chicksx%(8),chicksy%(8)
40MODE 7
50PROCdifficulty
60MODE1
70PROCinitialise
80REPEAT
90PROCmove man
100COLOUR1
110PRINTTAB(coopx%-1,coopy%-1)CHR$130+CHR$131+CHR$13
2
120COLOUR3
130PRINTTAB(coopx%-1,coopy%)CHR$133+CHR$134+CHR$135
140FORdelay%=1 TO (7-flock%)*30:NEXT
150PROCmove man
160PROCchicks
170PROCmove man
180UNTIL FALSE
1000DEFPROCmove man
1010X%=X%+(INKEY(-98) AND X%>0)-(INKEY(-67) AND X%<39
)
1020Y%=Y%+(INKEY(-73) AND Y%>0)-(INKEY(-105) AND Y%<2
9)
1030COLOUR1
1040PRINTTAB(X%,Y%)CHR$128
1050IF oldx%<>X% OR oldy%<>Y% THEN PRINTTAB(oldx%,old
y%)" "
1060oldx%=X%:oldy%=Y%
1070ENDPROC
2000DEFPROCchicks
2010SOUND1,1,200,1
2020FORI%=1 TO flock%
2030A%=chicksx%(I%):B%=chicksy%(I%)
2040PROCmove chicks
2050PRINTTAB(A%,B%)" "
2060COLOUR2
2070PRINTTAB(chicksx%(I%),chicksy%(I%))chick$
2080IFchicksx%(I%)=coopx% AND chicksy%(I%)=coopy% THE
N PROCcooped
2090NEXT
2100ENDPROC
3000DEFPROCmove chicks
3010IF X%>chicksx%(I%) THEN chicksx%(I%)=chicksx%(I%)
-1:chick$=CHR$129 ELSE IF X%<chicksx%(I%) THEN chicksx
%(I%)=chicksx%(I%)+1:chick$=CHR$136
3020IF Y%>chicksy%(I%) THEN chicksy%(I%)=chicksy%(I%)
-1 ELSE IF Y%<chicksy%(I%) THEN chicksy%(I%)=chicksy%(
I%)+1
3030IF chicksx%(I%)<1 THEN chicksx%(I%)=RND(4) ELSE I
F chicksx%(I%)>37 THEN chicksx%(I%)=33+RND(4)
3040IF chicksy%(I%)<1 THEN chicksy%(I%)=RND(4) ELSE I
F chicksy%(I%)>28 THEN chicksy%(I%)=24+RND(4)
3050ENDPROC
4000DEFPROCcooped
4010flock%=flock%-1
4020IF flock%=0 THEN PROCsuccess:ENDPROC ELSE FOR sou
nd%=50 TO 150 STEP 20:SOUND 1,-15,sound%,1:SOUND 2,-15
,sound%,1:SOUND 3,-15,sound%,1:NEXT
4030FOR J%=I% TO flock%
4040chicksx%(J%)=chicksx%(J%+1)
4050chicksy%(J%)=chicksy%(J%+1)
4060NEXT
4070I%=J%
4080ENDPROC
5000DEFPROCsuccess
5010time%=TIME DIV 100
5020score%=25*difficulty%-time%
5030difficulty%=difficulty%+1
5040IF difficulty%>7 THEN difficulty%=7
5050CLS
5060PRINTTAB(5,8)"CONGRATULATIONS!!"
5070PRINTTAB(0,12)"You captured all the chicks"
5080IF score%>0 THEN PRINT"in ";time%;" seconds" ELSE
PRINT'"But took too long!"
5090PRINT'''"You scored ";score%
5100flock%=difficulty%
5110IF score%>S% THEN S%=score%:PRINT''"You have the
highest score!"
5120PROCfanfare
5130PROCinitialise
5140PRINT''''"PRESS <space> CONTINUE"
5150REPEAT UNTIL INKEY(-99)
5160CLS
5170ENDPROC
6000DEFPROCdifficulty
6010FORI%=0 TO 9
6020FORJ%=0 TO 39 STEP 2
6030PRINTTAB(J%,I%)CHR$(128+RND(7))+CHR$157
6040NEXT
6050SOUND1,-15,I%*10,1
6060NEXT
6070PRINTTAB(13,2)CHR$132+CHR$157+CHR$141+CHR$135+"CH
ICKS"
6080PRINTTAB(13,3)CHR$132+CHR$157+CHR$141+CHR$135+"CH
ICKS"
6090PRINTTAB(5,6)CHR$134+CHR$157+CHR$132+"(C) STUART
SMALLEY, 1984"
6100PRINTTAB(0,11)"All the baby chicks have escaped a
nd    your job is to return them to the coop."
6110PRINT'"To do this you control a man who moves  by
pressing:-"
6120PRINT'"':'=UP '/'=DOWN 'Z'=LEFT 'X'=RIGHT"
6130PRINT'"The chicks always move away from you."
6140PRINT'"PRESS KEYS 1-5 FOR LEVEL OF DIFFICULTY"
6150REPEAT A$=GET$:UNTILINSTR("12345",A$)
6160difficulty%=VAL(A$)+2
6170ENDPROC
7000DEFPROCfanfare
7010FOR I%=1 TO 3
7020FOR sound%=10 TO 150 STEP 15
7030SOUND &201,-15,sound%,1
7040SOUND &202,-15,sound%,1
7050SOUND &203,-15,sound%,1
7060NEXT
7070NEXT
7080FOR sound%=150 TO 10 STEP -15
7090SOUND &201,-15,sound%,1
7100SOUND &202,-15,sound%,1
7110SOUND &203,-15,sound%,1
7120NEXT
7130ENDPROC
8000DEFPROCinitialise
8010FORI%=1 TO 8
8020chicksx%(I%)=RND(30)
8030chicksy%(I%)=RND(30)
8040NEXT
```

(continued on page 183)



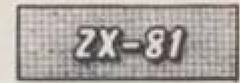
We're as enthusiastic about computers as you are.
Computer Fair
£1 off admission: voucher inside
Practical Computing

(continued from page 181)

```
8050VDU23,128,24,60,24,60,126,219,24,54
8060VDU23,129,56,120,24,14,31,31,14,17
8070VDU23,130,0,0,0,0,1,3,7,15
8080VDU23,131,16,56,124,254,255,255,255,255
8090VDU23,132,0,0,0,0,0,128,192,224
8100VDU23,133,7,7,7,7,7,7,7,7
8110VDU23,134,255,255,199,131,131,131,131,131
8120VDU23,135,192,192,192,192,192,192,192,192
8130VDU23,136,28,30,24,112,248,248,112,144
8140VDU23;8202;0;0;0;
8150ENVELOPE 1,1,5,5,-10,30,30,30,50,0,0,1,100,100
8160flock%=difficulty%
8170chick$=CHR$129
8180oldx%=10:oldy%=10
8190X%=10:Y%=10
8200coopx%=RND(20)+10:coopy%=RND(15)+10
8210TIME=0
8220ENDPROC
```

Castles of Carmain

John Wood,
Wednesbury,
West Midlands.



THIS IS A PROGRAM for the 16K ZX-81 called the Castles of Carmain. All the castles must be destroyed by typing in the angle of elevation, followed by the velocity of the cannon ball.

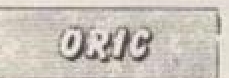
The castles appear randomly on each game but are always possible to hit. The cave is also drawn randomly.



```
1 LET HI=0
2 LET LE=10
3 LET L=1
4 LET SCORE=0
5 LET BALLS=7
7 GOSUB 9000
8 GOTO 1000
10 FAST
11 LET A=7
12 FOR N=9 TO 42
13 FOR F=0 TO (20+SQR (N/16))-15
14 PLOT N+10,F
15 NEXT F
16 NEXT N
17 FOR F=0 TO 17
18 FOR N=53 TO 63
19 PLOT N,F
20 NEXT N
21 NEXT F
22 FOR N=0 TO 19
23 PLOT N,0
24 NEXT N
25 SLOW
26 LET Z=INT (RND*3)+25
27 LET U=9
29 RETURN
40 FAST
51 FOR F=0 TO 63
52 PLOT F,0
53 NEXT F
54 FOR N=0 TO 33
55 FOR F=0 TO (22+20*SIN (N/32*PI))-30
56 PLOT N+16,F
57 NEXT F
58 NEXT N
59 LET U=18
60 LET Z=INT (RND*5)+23
61 UNPLOT 32,12
62 SLOW
63 RETURN
70 FAST
71 CLS
72 PRINT AT 5,0;"████████████";AT 21,0;"████████████"
73 FOR F=10 TO 20
74 FOR N=0 TO (RND*7)
75 PRINT AT N+5,F;"█";AT 21-N,30-F;"█"
76 NEXT N
77 NEXT F
78 LET U=18
79 LET Z=INT (RND*6)+21
80 SLOW
81 RETURN
100 FAST
101 CLS
102 PRINT AT 21,0;"████████████"
103 FOR F=10 TO 20 STEP 2
104 FOR N=21 TO (RND*10)+5 STEP -1
105 PRINT AT N,F;"█"
106 NEXT N
107 NEXT F
108 PRINT AT 18,12;"CARMIEN";AT 19,14;"█ █";AT 20,14;"   ";AT 21,14;"███"
109 LET U=18
110 LET Z=27
111 SLOW
112 RETURN
130 FAST
131 CLS
132 PRINT AT 10,20;"████████";AT 21,0;"████████████"
133 FOR F=11 TO 21
134 PRINT AT F,22;"████████"
135 NEXT F
136 LET U=6
137 LET Z=INT (RND*5)+20
138 SLOW
139 RETURN
999 STOP
1000 GOSUB LE
1010 PRINT AT 0,0;"SCORE 0000 CASTLE    BALLS███████";AT 0,10-LEN (STR$ SCORE);SCORE;AT 0,18;L;AT 0,25;(("████████"( TO 7-BALLS)) AND BALLS<>7)
1011 PRINT AT U,Z;"███";AT U+1,Z+1;"██";AT U+2,Z+1;"██";AT U+3,Z+1;"██"
1015 PRINT AT 19,0;"   ";AT 20,0;"██";AT 21,0;"██"
1020 PRINT AT 2,0;"ANGLE OF ELEVATION ? "
1030 INPUT E
1033 PRINT AT 20,0;("█  " AND E>45)+("█  " AND E<45);AT 19,0;("  █ " AND E>=45)+("   " AND E>=45)
1037 IF E>80 OR E<10 THEN GOTO 1030
1040 PRINT AT 2,0;"SPEED OF CANNON BALL?"
1050 INPUT S
1060 PRINT AT 2,0;"ELEVATION=";E;" SPEED=";S;"  "
1070 PRINT AT 4,0;"PRESS ""F"""
1080 IF INKEY$<>"F" THEN GOTO 1080
1090 FOR F=0 TO 4
1100 PRINT AT F,0;"
1200 NEXT F
1210 LET X=S*COS (PI*(E/180))
1220 LET Y=S*SIN (PI*(E/180))
1230 FOR F=0 TO Y/16
1240 LET O=.01*(Y*F-16*F*F)
1250 IF X*F>5700 THEN GOTO 1400
1260 IF O+6>40 THEN GOTO 1320
1270 PLOT (.01*X*F)+6,O+2
1280 LET C=PEEK (PEEK 16398+256*PEEK 16399)
1300 IF C<>0 THEN GOTO 1400
1310 UNPLOT (.01*X*F)+6,O+2
1320 NEXT F
1400 LET BALLS=BALLS-1
1402 IF X*F>5700 THEN GOTO 1410
1405 IF O+6<40 THEN UNPLOT (.01*X*F)+6,O+2
1420 IF C=8 OR C=9 THEN LET LE=LE+30
1430 IF C=8 OR C=9 THEN PRINT AT U,Z;"███";AT U+1,Z;"███";AT U+2,Z;"███";AT U,Z;"   ";AT U+1,Z;"   ";AT U+2,Z;"   ";AT U+3,Z;"███"
1440 IF C=8 OR C=9 THEN LET L=L+1
1441 IF C=8 OR C=9 THEN LET SCORE=SCORE+255
1442 IF LE=160 THEN GOTO 3000
1443 IF BALLS=0 THEN GOTO 2000
1445 IF C<>8 AND C<>9 THEN GOTO 1010
1446 FOR F=0 TO 50
1447 NEXT F
1450 CLS
1460 GOTO 1000
2000 IF SCORE>HI THEN LET HI=SCORE
2009 PRINT AT 2,0;"NO CANNONBALLS LEFT:R TO REPLAY",,"HI SCORE=";HI
2010 IF INKEY$="" THEN GOTO 2010
2020 IF INKEY$="R" THEN GOTO 2
2030 STOP
2040 SAVE "CASTLES"
2050 RUN
3000 CLS
3010 FOR F=0 TO 21
3020 PRINT TAB F;"WELL DONE"
3030 NEXT F
3040 PRINT AT 0,20;"███";AT 1,20;"████";AT 2,20;"███";AT 3,20;"
3050 PRINT AT 18,0;"███";AT 19,0;"████";AT 20,0;"███";AT 21,0;"
3060 PRINT AT 11,0;"████████████SCORE=";SCORE;"     HI=";
3070 IF SCORE>HI THEN LET HI=SCORE
3080 PRINT HI
3090 PRINT ""R" TO REPLAY ANY OTHER TO STOP."
3100 GOTO 2010
9000 CLS
9010 PRINT AT 0,0;"THE CASTLES OF CARMEIN",,"USING YOUR TRUSTY CANNON,YOU     MUST DESTROY ALL THE CASTLES     SURROUNDING THE CITY OF CARMEIN.FIRST ENTER THE ANGLE OF THE     CANNON,THEN THE SPEED OF THE     BALL.ALTHOUGH THE CASTLES        APPEAR IN SLIGHTLY DIFFERENT     POSITIONS EACH GAME,IT WILL      ALWAYS BE POSSIBLE TO HIT THEM   THE ANGLE OF ELEVATION MUST      BE GREATER THAN 10,NOT EXCEEDING80 DEGREES.IT IS POSSIBLE TO     SHOOT A BALL OFF THE SCREEN AT   A HIGH ANGLE,AND HIT A CASTLE    ON THE BALLS DESCENT."
9020 PRINT AT 21,7;"PRESS NEWLINE"
9030 IF INKEY$<>CHR$ 118 THEN GOTO 9030
9040 CLS
9050 RETURN
```

Subhunt

Mark Stewart,
Balerno,
Edinburgh.



SUBHUNT IS WRITTEN in machine code and it runs on the Oric-1 or Atmos 16K or 48K. The Atmos version has no sound.

The first program enables you to type in the code — program 2. Program 3 is the Basic controller program.

You have to guide a frogman through enemy waters to plant mines on the hulls of ships. The enemy has laid mines which you have to avoid and have filled the waters with mutant jellyfish and cloned sharks. Use A for up, Z for down and space bar to plant a mine.

48K owners must add:

4 POKE 8960,76:DOKE 8961,   #A300

I can supply it on cassette for £3. Send a cheque to Mark Stewart, 12 Whitelea Road.

Program 1.

```
#2BC
10 CLS
20 INPUT"ENTER START ADDRESS ";ST
30 PRINT"ENTER 'STOP' TO END."
40 PRINT
50 PRINTHEX$(ST);".?";:INPUTA$
55 IFA$="STOP"THENSTOP   ;
60 V=VAL(A$):POKEST,V
70 ST=ST+1
80 GOTO50
```

Program 2.

```
#2AF8 #20,#00,#A6,#EA,#20,#00,#A5,#EA
#2B00 #20,#00,#A4,#EA,#20,#00,#A0,#EA
#2B08 #20,#AB,#2F,#EA,#20,#C5,#32,#EA
#2B10 #20,#16,#2B,#60,#FC,#F4,#AD,#08
#2B18 #02,#C9,#84,#F0,#01,#60,#20,#1B
#2B20 #F4,#60,#FD,#76,#4E,#E2,#CA,#2A
#2B28 #2C,#2F,#47,#48,#55,#B5,#7D,#F7
#2B30 #BC,#DB,#CF,#5C,#AD,#08,#02,#C9
#2B38 #38,#F0,#01,#60,#A9,#AA,#8D,#08
#2B40 #02,#20,#AB,#2F,#60,#61,#48,#E1
#2B48 #20,#F8,#2A,#EA,#20,#FD,#34,#20
#2B50 #F8,#2A,#20,#FD,#34,#60,#EA,#20
#2B58 #34,#2B,#60,#DB,#92,#5F,#E3,#3A
#2B60 #D6,#37,#2F,#E0,#02,#D2,#7F,#0C
#2B68 #B0,#63,#76,#2A,#32,#7B,#72,#E7
#2B70 #7C,#B4,#6B,#4F,#DC,#94,#99,#65
#2B78 #64,#BE,#05,#55,#91,#AF,#3A,#4A
#2B80 #47,#63,#F4,#B5,#9A,#52,#6B,#10
#2B88 #BA,#F1,#6A,#8B,#E2,#3B,#93,#F9
#2B90 #9D,#D2,#BE,#8B,#CC,#BB,#8B,#30
#2B98 #AD,#24,#4A,#06,#69,#2C,#92,#77
#2BA0 #AD,#05,#7B,#76,#B0,#5E,#5B,#69
#2BA8 #15,#B6,#74,#04,#B0,#B7,#2B,#96
#2BB0 #B6,#09,#FA,#3B,#74,#44,#91,#07
```

(continued on next page)

(continued from previous page)

```
#2BB8 #AB,#C8,#0B,#29,#4A,#50,#61,#A5
#2BC0 #72,#82,#D6,#DD,#57,#2F,#3A,#D1
#2BC8 #C9,#60,#9B,#F0,#78,#53,#77,#9A
#2BD0 #60,#37,#0E,#0B,#65,#45,#AD,#BD
#2BD8 #25,#89,#52,#3E,#78,#F2,#8E,#6B
#2BE0 #85,#89,#B3,#84,#20,#B2,#EE,#06
#2BE8 #96,#2F,#7F,#0A,#AD,#9F,#2E,#DF
#2BF0 #75,#9B,#FD,#BE,#BD,#67,#B0,#B3
#2BF8 #DD,#F7,#2F,#9B,#CF,#0E,#F1,#85
#2C00 #5F,#51,#2E,#9B,#E3,#D8,#25,#D6
#2C08 #A1,#06,#BF,#99,#6C,#A8,#EC,#D1
#2C10 #71,#1C,#F0,#11,#3B,#4B,#70,#DE
#2C18 #65,#BE,#D2,#0B,#4D,#24,#EF,#22
#2C20 #65,#F6,#54,#56,#E5,#14,#71,#06
#2C28 #E1,#3E,#5B,#E3,#4A,#9D,#3C,#05
#2C30 #64,#FB,#BD,#27,#CF,#43,#BB,#BD
#2C38 #49,#B2,#CB,#2B,#3B,#C2,#22,#67
#2C40 #A2,#D3,#A0,#73,#0B,#6B,#F0,#EC
#2C48 #42,#7B,#D6,#3B,#53,#07,#CB,#60
#2C50 #6E,#4F,#F4,#3A,#AD,#D9,#22,#DB
#2C58 #E5,#FA,#71,#B5,#85,#72,#05,#46
#2C60 #F7,#EF,#1F,#00,#BB,#BC,#B7,#C1
#2C68 #44,#24,#D6,#D5,#B3,#9B,#B5,#EA
#2C70 #F1,#B6,#BF,#0B,#52,#40,#B3,#F1
#2C78 #DF,#BB,#B4,#B2,#55,#96,#2E,#CF
#2C80 #64,#6E,#B1,#4B,#B3,#50,#C2,#EC
#2C88 #DE,#8A,#8E,#7F,#D6,#99,#AC,#63
#2C90 #D3,#74,#06,#DC,#9F,#5E,#16,#66
#2C98 #0E,#02,#2A,#DB,#53,#71,#89,#61
#2CA0 #E7,#7B,#91,#DF,#17,#2B,#B6,#BA
#2CA8 #0A,#B4,#E9,#00,#F6,#EA,#5F,#5F
#2CB0 #BE,#5A,#E9,#95,#47,#E1,#1B,#B2
#2CB8 #DA,#1E,#60,#71,#EB,#B6,#24,#62
#2CC0 #F1,#54,#5F,#C4,#21,#A3,#F4,#93
#2CC8 #13,#9A,#1F,#93,#F3,#21,#D5,#E6
#2CD0 #FC,#EC,#5D,#B6,#29,#9B,#BB,#74
#2CD8 #C6,#B3,#1B,#57,#32,#64,#3D,#40
#2CE0 #2E,#A1,#50,#C9,#BD,#99,#24,#BA
#2CE8 #BD,#B6,#6B,#35,#5D,#DE,#F0,#A1
#2CF0 #34,#62,#E7,#0D,#48,#7E,#B2,#CC
#2CF8 #34,#99,#C4,#24,#7B,#9C,#09,#A5
#2D00 #A7,#9F,#5D,#0B,#74,#64,#07,#01
#2D08 #AB,#9C,#4D,#35,#AE,#01,#51,#9A
#2D10 #9D,#02,#66,#9D,#07,#BD,#2F,#C3
#2D18 #53,#27,#A2,#99,#E5,#13,#F0,#1B
#2D20 #0F,#1A,#AB,#44,#53,#BC,#F0,#42
#2D28 #B5,#64,#56,#32,#A1,#0B,#D2,#B5
#2D30 #4F,#16,#BB,#B2,#DB,#63,#24,#C6
#2D38 #DD,#BD,#61,#30,#69,#D3,#2F,#5B
#2D40 #3B,#65,#1E,#C7,#5B,#47,#9C,#CE
#2D48 #1E,#69,#DF,#77,#EB,#A3,#AD,#1D
#2D50 #35,#1F,#4D,#1F,#70,#E5,#E7,#CC
#2D58 #3B,#F5,#BD,#C5,#BF,#0A,#B4,#44
#2D60 #2B,#22,#4F,#96,#34,#51,#9D,#EF
#2D68 #7E,#C7,#23,#6C,#47,#C2,#2B,#6E
#2D70 #B7,#73,#BC,#35,#53,#BB,#3E,#B9
#2D78 #DE,#3D,#0F,#2A,#19,#1F,#B6,#79
#2D80 #6F,#2B,#63,#E1,#C3,#BB,#B2,#59
#2D88 #A2,#DD,#B3,#5B,#4A,#A9,#B4,#B5
#2D90 #C6,#AC,#5D,#7F,#A4,#A4,#50,[illegible]
#2D98 #D6,#C2,#DF,#33,#AC,#F0,#A1,#1D
#2DA0 #0D,[illegible],#8F,#10,#25,#A5,#FA,#6B
#2DA8 #D1,#B3,#DA,#9F,#4E,#40,#21,#0D
#2DB0 #BB,#3F,#F3,#92,#AD,#C9,#D4,#CE
#2DB8 #49,#22,#BE,#39,#0E,#EA,#67,#CE
#2DC0 #CE,#54,#0E,#5E,#E9,#C5,#2D,#1E
#2DC8 #BD,#B6,#D4,#91,#B1,#C5,#EA,#66
#2DD0 [illegible],[illegible],#6F,#FB,#0A,#EB,#A0,#AC
#2DD8 [illegible],[illegible],#56,[illegible],#7D,#1B,#D6,#18
#2DE0 #20,#BD,#BA,#6A,#7B,#B9,#48,#55
#2DE8 #99,#A3,#D7,#39,#A3,#0C,#25,#BD
#2DF0 #32,#9D,#00,#DC,#F4,#0B,#F4,#41
#2DF8 #D6,#A2,#26,#51,#60,#43,#49,#9F
#2E00 #10,#2C,#49,#14,#02,#3B,#B4,#4B
#2E08 #AD,#B2,#E6,#BA,#C9,#72,#F1,#BE
#2E10 #25,#EF,#F0,#F6,#6D,#A9,#3D,#4C
#2E18 #13,#FD,#3B,#F5,#A1,#A9,#2B,#93
#2E20 #7B,#75,#BD,#A3,#BA,#73,#FB,#7B
#2E28 #FC,#3F,#6B,#D9,#1F,#59,#C1,#92
#2E30 #D6,#B3,#CC,#2A,#49,#DC,#FD,#B9
#2E38 #6F,#20,#57,#AF,#52,#07,#9A,#FB
#2E40 #32,#54,#B7,#4D,#BB,#96,#4E,#BC
#2E48 #D3,#BA,#75,#61,#49,#60,#DE,#5B
#2E50 #4D,#3F,#C2,#F6,#76,#12,#F4,#3B
#2E58 #3B,#0F,#E4,#51,#BB,#B0,#D2,#4A
#2E60 #A7,#1B,#4A,#6C,#34,#0B,#05,#D3
#2E68 #33,#E6,#BF,#F6,#51,#BF,#16,#0D
#2E70 #57,#59,#5D,#B5,#57,#73,#CD,#99
#2E78 #B9,#94,#32,#13,#E6,#24,#31,#CF
#2E80 #DE,#9B,#7A,#4D,#B7,#0B,#AE,#B7
#2E88 #BB,#E7,#55,#5F,#B4,#D5,#5C,#C4
#2E90 #42,#FB,#F6,#E7,#E0,#97,#B0,#B2
#2E98 #AB,#50,#4F,#3D,#B0,#A5,#B6,#24
#2EA0 #E6,#D0,#CE,#BB,#43,#0E,#5E,#30
#2EA8 #F7,#55,#99,#5D,#FB,#29,#BA,#CB
#2EB0 #4B,#1D,#EB,#FC,#AB,#42,#A7,#B0
#2EB8 #29,#19,#1C,#7B,#01,#6F,#D5,#E4
#2EC0 #DB,#AE,#35,#D1,#E5,#4B,#0B,#7E
#2EC8 #02,#64,#7B,#4B,#F6,#FB,#D3,#B5
#2ED0 #00,#E2,#44,#0C,#BB,#B0,#53,#1B
#2ED8 #91,#65,#DE,#33,#41,#7B,#9D,#A6
#2EE0 #42,#3D,#D3,#21,#91,#D0,#57,#05
#2EE8 #DB,#11,#3B,#2D,#32,#09,#21,#BE
#2EF0 #BD,#5B,#39,#A7,#E9,#16,#50,#65
#2EF8 #BA,#B9,#90,#23,#1C,#EB,#27,#CA
#2F00 #75,#E9,#3E,#BE,#21,#6B,#4F,#BD
#2F08 #4B,#2B,#BA,#C2,#24,#5A,#AD,#ED
#2F10 #5D,#32,#42,#11,#37,#3E,#9A,#C2
#2F18 #26,#5E,#7B,#AF,#39,#F1,#C1,#96
#2F20 #56,#3B,#9E,#F9,#B4,#F6,#59,#F0
#2F28 #47,#5F,#51,#46,#7C,#51,#BB,#19
#2F30 #7A,#53,#17,#E6,#C6,#43,#9F,#DA
#2F38 #55,#D0,#0B,#7F,#C7,#C9,#24,#66
#2F40 #99,#4A,#CC,#EA,#14,#C0,#57,#C4
#2F48 #DB,#F7,#41,#B0,#62,#06,#F3,#39
#2F50 #11,#E5,#02,#A5,#FB,#45,#56,#21
#2F58 #B5,#FC,#53,#BD,#E2,#51,#EC,#3B
#2F60 #94,#B0,#25,#7F,#59,#22,#4B,#25
#2F68 #44,#74,#0D,#57,#FD,#64,#4D,#B2
#2F70 #F5,#C0,#D7,#66,#AA,#32,#E6,#9B
#2F78 #DB,#B3,#74,#B9,#BD,#2F,#C0,#F6
#2F80 #10,#BE,#74,#5B,#A0,#FD,#94,#43
#2F88 #E9,#5B,#0D,#14,#C1,#BB,#6D,#76
#2F90 #DB,#44,#ED,#2D,#99,#92,#30,#19
#2F98 #C0,#24,#37,#B2,#4E,#B3,#DB,#FD
#2FA0 #22,#64,#A0,#51,#D2,#BD,#BC,#60
#2FA8 #AD,#0B,#02,#C9,#AE,#D0,#03,#4C
#2FB0 #5B,#30,#AD,#0B,#02,#C9,#AA,#D0
#2FB8 #03,#4C,#BC,#30,#EA,#EA,#EA,#EA
#2FC0 #EA,#EA,#EA,#EA,#EA,#EA,#EA,#EA
#2FC8 #EA,#EA,#EA,#EA,#EA,#EA,#EA,#EA
#2FD0 #AC,#04,#04,#A9,#6A,#91,#02,#C8
#2FD8 #A9,#6B,#91,#02,#C8,#B1,#02,#C9
#2FE0 #21,#30,#03,#4C,#C0,#30,#20,#D4
#2FE8 #30,#AC,#04,#04,#B1,#02,#C9,#73
#2FF0 #30,#03,#4C,#C0,#30,#C8,#B1,#02
#2FF8 #C9,#73,#30,#03,#4C,#C0,#30,#20
#3000 #E1,#30,#20,#E1,#30,#AC,#04,#04
#3008 #B1,#02,#C9,#73,#30,#03,#4C,#C0
#3010 #30,#C8,#B1,#02,#C9,#73,#30,#03
#3018 #4C,#C0,#30,#AC,#04,#04,#20,#D4
#3020 #30,#AE,#11,#04,#E0,#02,#F0,#05
#3028 #EB,#BE,#11,#04,#60,#AC,#04,#04
#3030 #B1,#02,#C9,#6A,#D0,#0B,#A9,#6C
#3038 #BD,#04,#2F,#A2,#00,#BE,#11,#04
#3040 #60,#A9,#6A,#BD,#D4,#2F,#A2,#00
#3048 #8E,#11,#04,#60,#30,#4C,#3A,#30
#3050 #60,#C8,#BC,#04,#04,#4C,#D0,#2F
#3058 #AE,#00,#04,#E0,#04,#D0,#03,#4C
#3060 #D0,#2F,#AC,#04,#04,#A9,#20,#91
#3068 #02,#C8,#91,#02,#20,#E1,#30,#CA
#3070 #AC,#04,#04,#B1,#02,#C9,#21,#30
#3078 #03,#4C,#C0,#30,#C8,#B1,#02,#C9
#3080 #21,#30,#03,#4C,#C0,#30,#8E,#00
#3088 #04,#4C,#D0,#2F,#AE,#00,#04,#E0
#3090 #1B,#D0,#03,#4C,#D0,#2F,#AC,#04
#3098 #04,#A9,#20,#91,#02,#C8,#91,#02
#30A0 #20,#D4,#30,#EB,#BE,#00,#04,#AC
#30A8 #04,#04,#B1,#02,#C9,#21,#30,#03
#30B0 #4C,#C0,#30,#C8,#B1,#02,#C9,#21
#30B8 #30,#03,#4C,#C0,#30,#4C,#D0,#2F
#30C0 #4C,#F0,#30,#60,#EA,#BE,#00,#04
#30C8 #A2,#02,#BE,#04,#04,#60,#60,#4B
#30D0 #AD,#5A,#AB,#35,#18,#A9,#28,#65
#30D8 #02,#B5,#02,#90,#02,#E6,#03,#60
#30E0 #EA,#38,#AD,#02,#00,#E9,#28,#B5
#30E8 #02,#B0,#02,#C6,#03,#60,#60,#EA
#30F0 #20,#17,#F4,#AC,#04,#04,#20,#D4
#30F8 #30,#B1,#02,#C9,#6A,#D0,#03,#4C
#3100 #46,#31,#CB,#B1,#02,#C9,#6B,#D0
#3108 #03,#4C,#46,#31,#20,#E1,#30,#20
#3110 #E1,#30,#AC,#04,#04,#B1,#02,#C9
#3118 #6A,#D0,#03,#4C,#61,#31,#C8,#B1
#3120 #02,#C9,#6B,#D0,#03,#4C,#61,#31
#3128 #20,#D4,#30,#AC,#04,#04,#A9,#7C
#3130 #91,#02,#C8,#91,#02,#20,#7C,#31
#3138 #AC,#04,#04,#A9,#20,#91,#02,#C8
#3140 #91,#02,#4C,#00,#32,#60,#AC,#04
#3148 #04,#A9,#7C,#91,#02,#C8,#91,#02
#3150 #20,#7C,#31,#AC,#04,#04,#A9,#20
#3158 #91,#02,#C8,#91,#02,#4C,#00,#32
#3160 #60,#AC,#04,#04,#A9,#7C,#91,#02
#3168 #C8,#91,#02,#20,#7C,#31,#AC,#04
#3170 #04,#A9,#20,#91,#02,#C8,#91,#02
#3178 #4C,#00,#32,#60,#A2,#00,#BE,#01
#3180 #04,#A2,#00,#BE,#02,#04,#A2,#FF
#3188 #CA,#E0,#00,#F0,#03,#4C,#BB,#31
#3190 #AE,#01,#04,#E0,#FF,#F0,#07,#EB
#3198 #BE,#01,#04,#4C,#B6,#31,#AE,#02
#31A0 #04,#E0,#FF,#F0,#07,#EB,#BE,#02
#31A8 #04,#4C,#B6,#31,#60,#A2,#04,#BE
#31B0 #00,#04,#A2,#0A,#BE,#04,#04,#A9
#31B8 #BC,#B5,#03,#A9,#4B,#B5,#02,#A2
#31C0 #01,#BE,#10,#04,#60,#6B,#C4,#41
#31C8 #0E,#E5,#CF,#99,#3C,#0F,#AC,#04
#31D0 #04,#BB,#EA,#B1,#02,#C9,#21,#10
#31D8 #01,#60,#4C,#F0,#30,#60,#ED,#2E
#31E0 #61,#CB,#4D,#07,#A9,#F6,#0B,#52
#31E8 #A0,#B2,#17,#C6,#E0,#BE,#EE,#24
#31F0 #01,#27,#4D,#66,#A2,#B2,#B4,#0B
#31F8 #C9,#62,#0D,#0D,#CE,#B1,#F7,#0F
#3200 #20,#AD,#31,#EA,#A2,#01,#BE,#10
#3208 #04,#EA,#60,#15,#75,#B9,#F1,#22
#3210 #4D,#E4,#C9,#E1,#E7,#59,#AF,#FB
#3218 #90,#93,#5F,#B0,#A3,#54,#BC,#C2
#3220 #9B,#09,#F4,#E3,#A3,#BD,#34,#9E
#3228 #BF,#AE,#30,#B4,#F6,#C1,#32,#D2
#3230 #9C,#22,#15,#9B,#BC,#D1,#6C,#DD
#3238 #4E,#F2,#B9,#E4,#D1,#D1,#B4,#EB
#3240 #ED,#9B,#B3,#5B,#2B,#B6,#2B,#02
#3248 #B1,#65,#5F,#3F,#5B,#5B,#D0,#12
#3250 #9F,#DC,#AA,#13,#37,#0A,#BB,#B1
#3258 #5B,#C1,#EB,#26,#AB,#DA,#D2,#9B
#3260 #2C,#0E,#EB,#C4,#BF,#E6,#D3,#A7
#3268 #3E,#C4,#FD,#5D,#E4,#61,#5A,#A5
#3270 #76,#5B,#64,#CC,#62,#D6,#66,#05
#3278 #BB,#A1,#C5,#90,#A2,#5B,#DD,#0D
#3280 #07,#B4,#25,#BD,#DD,#62,#7A,#9B
#3288 #96,#52,#01,#4C,#5C,#12,#CF,#67
#3290 #19,#BA,#3B,#A6,#40,#5F,#32,#A2
#3298 #F5,#C5,#59,#29,#15,#BB,#C6,#1C
#32A0 #A0,#7D,#1A,#7B,#64,#1E,#2E,#3B
#32A8 #9F,#C1,#BD,#ED,#47,#B0,#02,#DA
#32B0 #FB,#E7,#64,#E7,#0D,#6B,#DF,#2B
#32B8 #D0,#B1,#B1,#A9,#A1,#47,#C0,#BF
#32C0 #B7,#0B,#91,#61,#4B,#20,#F6,#32
#32C8 #AE,#03,#04,#E0,#01,#D0,#01,#60
#32D0 #AD,#0B,#02,#C9,#B4,#F0,#01,#60
#32D8 #AE,#00,#04,#E0,#04,#F0,#01,#60
#32E0 #AC,#04,#04,#B9,#F9,#BB,#C9,#49
#32E8 #10,#01,#60,#A9,#21,#99,#20,#BC
#32F0 #A2,#01,#BE,#03,#04,#60,#AD,#26
#32F8 #BC,#C9,#21,#F0,#01,#60,#AD,#FE
#3300 #BB,#C9,#49,#10,#07,#60,#A2,#00
#3308 #BE,#03,#04,#60,#A9,#59,#BD,#FE
#3310 #BB,#A9,#5A,#BD,#FF,#BB,#A9,#57
#3318 #BD,#D6,#BB,#A9,#5B,#BD,#D7,#BB
#3320 #20,#17,#F4,#A2,#00,#BE,#02,#04
#3328 #A2,#00,#BE,#01,#04,#A2,#FF,#CA
#3330 #E0,#00,#D0,#FB,#AE,#01,#04,#E0
#3338 #C8,#F0,#07,#EB,#BE,#01,#04,#4C
#3340 #2D,#33,#AE,#02,#04,#E0,#01,#F0
#3348 #07,#EB,#BE,#02,#04,#4C,#2B,#33
#3350 #A2,#01,#A0,#03,#A9,#20,#91,#04
#3358 #C0,#09,#F0,#04,#C8,#4C,#54,#33
#3360 #E0,#02,#F0,#0F,#EB,#1B,#A9,#2B
#3368 #65,#04,#B5,#04,#90,#02,#E6,#05
#3370 #4C,#52,#33,#A2,#04,#BE,#64,#00
#3378 #20,#00,#23,#A2,#00,#BE,#03,#04
#3380 #A9,#20,#BD,#26,#BC,#A9,#BB,#B5
#3388 #05,#A9,#D0,#B5,#04,#60,#FB,#DC
#3390 #31,#AB,#BD,#D4,#AB,#59,#1E,#75
#3398 #9A,#D2,#7C,#D4,#F9,#6B,#29,#32
#33A0 #DB,#13,#ED,#47,#0E,#32,#34,#21
#33A8 #B9,#3B,#0B,#4E,#FB,#2F,#03,#0E
#33B0 #FC,#A5,#45,#A5,#74,#B9,#49,#16
#33B8 #2E,#65,#23,#4E,#7A,#47,#71,#94
#33C0 #B7,#4D,#14,#3B,#52,#3C,#66,#7B
#33C8 #DB,#E7,#25,#70,#4A,#FA,#DF,#60
#33D0 #FC,#79,#B7,#BC,#2D,#B9,#4F,#E5
#33D8 #CC,#EC,#97,#19,#BA,#F4,#65,#B2
#33E0 #E0,#E3,#B5,#0A,#13,#93,#C9,#E4
#33E8 #F2,#C0,#2E,#BE,#FB,#09,#72,#46
#33F0 #CC,#C5,#B3,#E2,#36,#4B,#B3,#C5
#33F8 #99,#4E,#FC,#F5,#0C,#6D,#1D,#60
#3400 #96,#B1,#E4,#3C,#2B,#20,#25,#02
#3408 #BB,#2C,#EF,#E5,#32,#43,#37,#9E
#3410 #D6,#2C,#C5,#76,#46,#BA,#AA,#5C
#3418 #96,#94,#B2,#55,#CB,#D2,#5A,#4E
#3420 #A9,#1E,#1E,#0C,#00,#00,#00,#00
#3428 #00,#92,#29,#1B,#34,#00,#00,#00
#3430 #00,#1F,#0B,#00,#00,#D5,#BF,#2B
#3438 #26,#CD,#1C,#27,#26,#1D,#6C,#49
#3440 #2C,#3D,#43,#29,#45,#D5,#5C,#57
#3448 #09,#90,#CD,#16,#B5,#F6,#DF,#72
#3450 #7B,#EE,#1D,#3C,#FC,#9E,#9F,#AA
#3458 #95,#BC,#2E,#00,#27,#3B,#30,#0C
#3460 #23,#01,#00,#09,#00,#1E,#0C,#00
#3468 #00,#00,#00,#04,#C0,#C3,#F7,#00
#3470 #03,#20,#1B,#03,#20,#3B,#3C,#3E
#3478 #0C,#10,#0C,#00,#1B,#00,#30,#3F
#3480 #35,#00,#20,#00,#00,#F4,#5D,#31
#3488 #16,#B6,#F3,#E3,#2F,#26,#3B,#41
#3490 #ED,#5E,#FC,#1A,#F5,#1B,#14,#B4
#3498 #E0,#7E,#46,#5D,#44,#9B,#BC,#35
#34A0 #71,#DF,#60,#13,#B3,#4D,#0B,#CE
#34A8 #1C,#CA,#F5,#CB,#7A,#11,#1B,#9D
#34B0 #70,#76,#3E,#37,#51,#A6,#5B,#B1
#34B8 #D6,#F4,#B4,#9F,#A2,#00,#BE,#4B
#34C0 #04,#20,#4B,#2B,#AE,#10,#04,#E0
#34C8 #01,#D0,#03,#4C,#E3,#34,#AE,#4B
#34D0 #04,#EC,#4B,#04,#D0,#03,#4C,#E0
#34D8 #34,#EB,#BE,#4B,#04,#4C,#C1,#34
#34E0 #4C,#BC,#34,#A2,#00,#BE,#19,#04
#34E8 #60,#C3,#9F,#B1,#2F,#C9,#62,#B3
#34F0 #3B,#B2,#FA,#7B,#6C,#B6,#3F,#9C
#34F8 #C4,#9D,#BE,#F3,#7D,#60,#FA,#55
```

Program 3.

```
0 GOSUB200:GOSUB300:POKE1040,0:POKE1041,0:POKE1027,0:HI$="00000":SC$="00000"
1 CLS:PAPER6:INK0:CALL#A220:FORN=48080TO48120STEP40:POKEN,23:POKEN+1,5
2 POKEN+2,4:NEXT:POKE48040,23:PLOT5+L,0,"        WAVE: 1":PLOT30+L,26,HI$
3 POKE775,50:HIMEM6000:POKE618,10:POKE48041,0
4 IFPEEK(13576)<>30THENPOKE8960,76:DOKE8961,#A300
5 IFDEEK(#245)<>0THENL=1ELSEL=0
8 POKE1024,4:DOKE2,48200
9 CALL13500
10 POKE775,39
11 PING
20 FORN=1TO12:PLOT13+L,N,CHR$(14)+CHR$(0)+"GAME OVER"+CHR$(8):NEXT:WAIT300
30 SC$="":HI$="":FORN=1TO15:SC$=SC$+CHR$(SCRN(N+L,26))
40 HI$=HI$+CHR$(SCRN(N+20+L,26)):NEXT:CLS:PAPER1:INK0
41 PLOT2,25,CHR$(7)+"COPYRIGHT 1984 MARK STEWART   "+CHR$(17)
50 FORN=1TO2:PLOT13+L,N,CHR$(10)+CHR$(3)+"AQUA MAN":PLOT12+L,N,20
60 PLOT25+L,N,17:NEXT
70 PLOT10+L,6,"YOUR SCORE: "+SC$:PLOT10+L,8,"HIGH SCORE: "+HI$
80 IFVAL(SC$)>VAL(HI$)THENGOTO100
89 POKE1027,0:POKE1040,0:POKE1041,0:A$=KEY$+KEY$
90 PLOT7+L,20,"PRESS A KEY FOR A GAME"
91 PLOT6+L,15,CHR$(10)+CHR$(5)+CHR$(14)+"BLOW UP THE SHIPS"
92 PLOT6+L,16,CHR$(10)+CHR$(5)+CHR$(14)+"BLOW UP THE SHIPS"
93 REPEAT:SOUND1,0,0:WAIT20:SOUND1,500,5
99 :UNTILKEY$<>"":SOUND1,0,0:GOSUB200:GOTO1
100 PLOT7+L,10,CHR$(12)+"YOU HAVE THE HI SCORE":HI$=SC$:GOTO89
200 DOKE2,48200:POKE1024,4:DOKE4,48080:IFDEEK(#245)=0THENL=0:GOTO202
201 L=1
202 CLS:PAPER0:PLOT9,1,CHR$(2)+"SKILL LEVELS":PLOT10,3,CHR$(4)+"1    EASY"
203 PLOT10,5,CHR$(1)+"2    HARDER":PLOT10,7,CHR$(3)+"3    VERY HARD"
204 GETK$:POKE13565,96
205 IFK$="1"THENPOKE1096,0:DOKE11085,13565:DOKE11091,13565:DOKE630,1500
206 IFK$="2"THENPOKE1096,255::DOKE11085,13565:DOKE11091,13565:DOKE630,2750
207 IFK$="3"THENPOKE1096,245:DOKE11085,11060:DOKE11091,11060:DOKE630,3500
208 RETURN
300 IFPEEK(46080+(97*8))=63THENRETURN
301 FORG=1TO26:READD$
310 FORN=0TO7:READD:POKE46080+ASC(D$)*8+N,D:NEXTN
320 NEXTG
330 DATA"a",63,63,63,63,63,63,63,63
331 DATA"b",0,63,63,63,63,63,63,63
332 DATA"c",0,0,63,63,63,63,63,63
333 DATA"d",0,0,0,63,63,63,63,63
334 DATA"e",0,0,0,0,63,63,63,63
335 DATA"f",0,0,0,0,0,63,63,63
336 DATA"g",0,0,0,0,0,0,63,63
337 DATA"h",0,0,0,0,0,0,0,63
338 DATA"i",0,0,0,0,0,0,0,0
339 DATA"j",0,51,47,3,4,56,32,0
340 DATA"k",4,47,63,54,24,6,0,0
350 DATA"l",192,195,247,43,0,0,0,0
360 DATA"o",0,0,63,55,31,1,15,0
361 DATA"p",3,7,63,58,58,26,63,0
362 DATA"q",32,0,57,63,63,61,56,0
363 DATA"r",24,48,32,32,32,32,48,24
364 DATA"s",3,15,31,63,25,5,9,16
365 DATA"t",32,56,60,62,12,16,12,34
366 DATA"u",0,12,18,63,45,30,12,0
367 DATA"}",0,27,47,27,1,62,9,0
368 DATA"[",0,39,59,48,12,35,1,0
369 DATA"{",0,27,47,27,1,62,9,0
370 DATA"]",0,48,63,53,0,32,0,0
371 DATA"|",4,16,2,8,33,8,32,4
372 DATA"",30,30,12,0,0,0,0,0
373 DATA"",0,0,0,0,31,8,0,0
374 FORN=47104+(87*8)TO47831:READD:POKEN,D:NEXTN
375 DATA34,18,5,0,10,10,61,6,1,18,36,0,8,42,32,52,7,18,4,9,2,16,3,0,36,16,70
376 DATA36,4,18,1,1
377 FORN=47104+(65*8)TO47104+(75*8):READD:POKEN,D:NEXTN
378 DATA0,0,0,0,0,56,12,30,28,8,10,30,46,62,47,63,0,8,8,8,8,12,30,31,0,0,0
379 DATA1,2,4,6,15,63,31,15,15,7,3,1,0,62,62,63,63,63,63,63,63,55,55
380 DATA62,62,63,63,63,63,31,62,62,62,62,62,63,63,15,15,63,62,63,62,63,62,62
390 DATA63,62,62,62,62,56,48,255
400 RETURN
500 REM THE MACHINE CODE IS LOCATED
501 REM BETWEEN #A000-#A800 & 11000-13567
502 REM ALL OF IT IS ESSENTIAL
503 REM COPYRIGHT 1984 MARK STEWART
600 POKE10999,96:POKE40959,96
610 CSAVE"CODE 1",A10999,E13567,AUTO:CSAVE"CODE 2",A40959,E#A850,AUTO
615 CSAVE"BASIC
620 GETK$:IFK$="E"THENEND
630 GOTO610
```

Swoosh

L W Betteridge,
Colne,
Lancashire.



SWOOSH RUNS on a Vic-20 with a joystick and 3K memory expansion. If more memory is added such as a 16K then the following must be entered first.

POKE641,0:POKE642,4:POKE643,0:
POKE644,30:POKE648,30:SYS64824

The program comes in two parts, the first being the instructions. This part also doubles the screen size to a 30 by 34 display. This program should be entered first otherwise the second part will not run. The second part contains the game which is as follows:

The object is to fly your glider to pick up the bombs from the middle mountain and *(continued on page 189)*





THE ROTRONICS DR2301 COMPUTER/ AUDIO CASSETTE RECORDER

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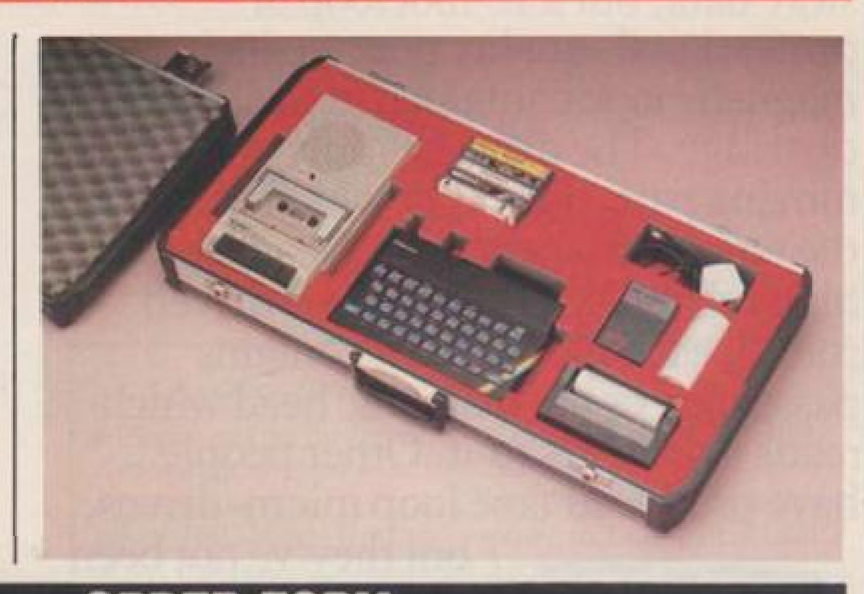
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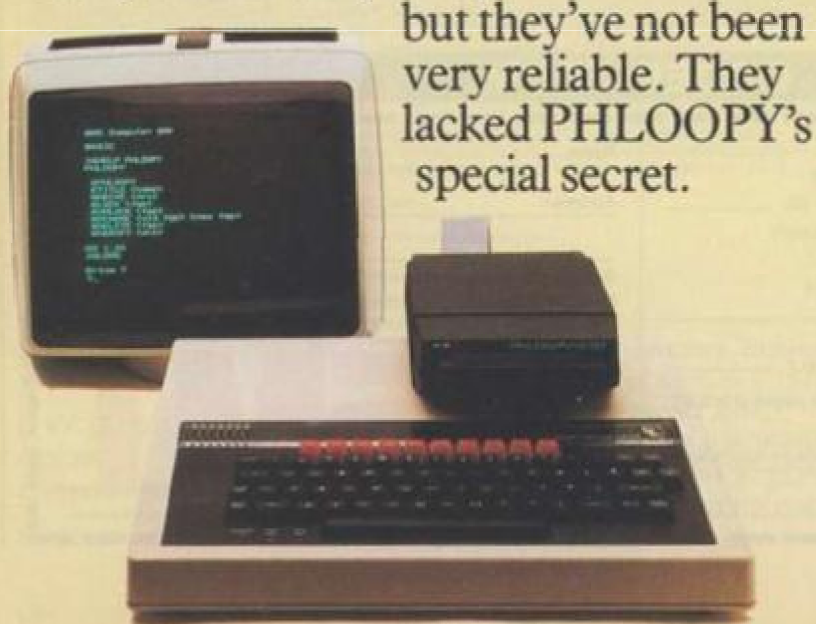
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How PHLOOPY does it

PHLOOPY does not use disks to store data, but a 12-foot loop of professional-quality quarter-inch magnetic tape contained in a robust cartridge. The drive has only one moving part, the motor which drives the tape loop – hence the low price and high reliability. As the loop is driven round, each file of data it contains passes across the magnetic head which reads it or writes to it. Other people have produced tape loop micro-drives, but they've not been very reliable. They lacked PHLOOPY's special secret.



PHLOOPY's special secret

The heart of the invention is a brilliantly designed "byte-wide" magnetic head, made by Phi Magnetronics who build multi-track heads for professional use. PHLOOPY's head records and reads nine tracks across the width of a quarter-inch tape. That means the tape loop can be much shorter, so the typical time to access a file is reduced to a mere 3 seconds. If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance.

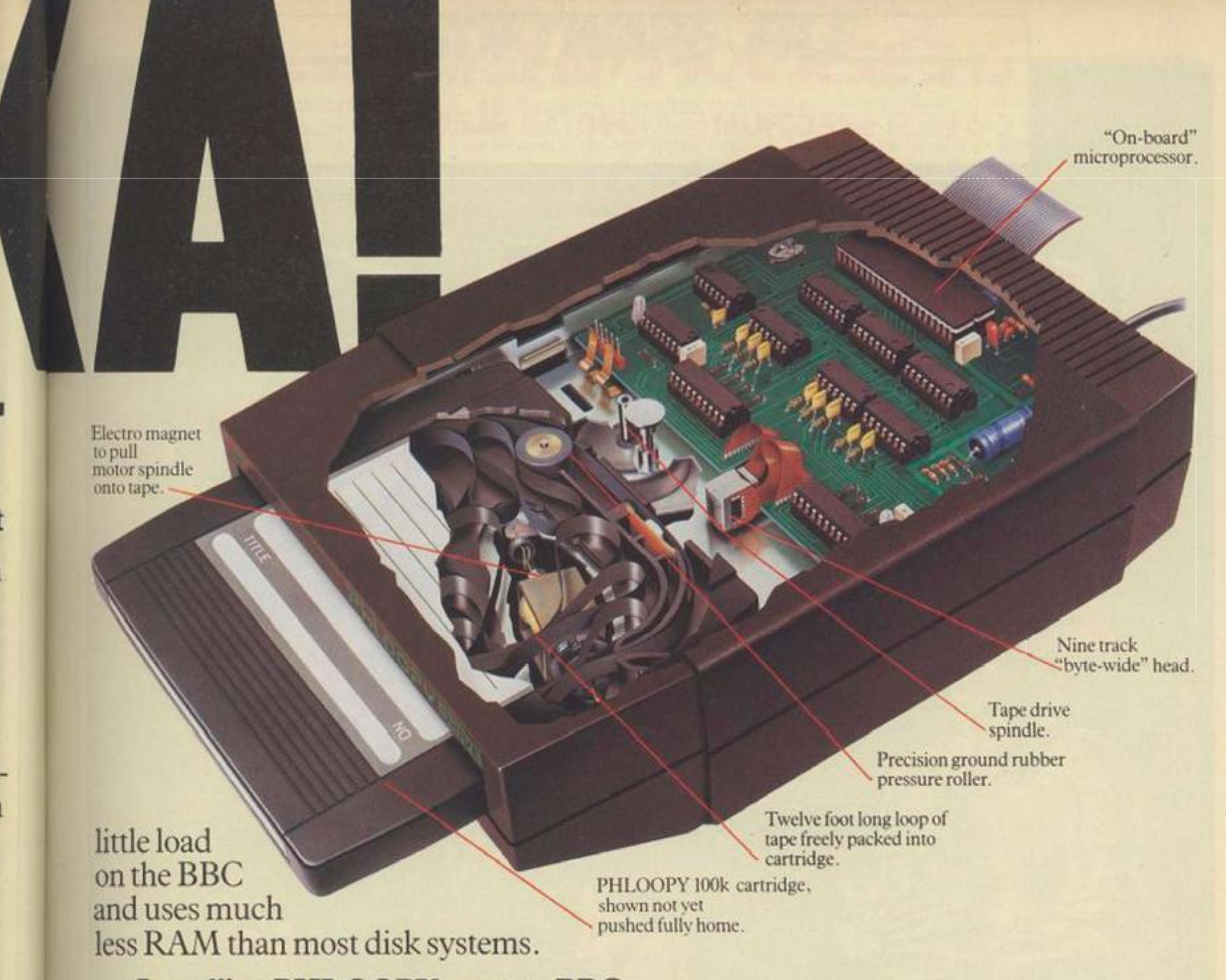
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PHLOOPY's own software, contained in ROM, responds to standard BBC filing system and Basic commands. Most programs written to run on disk or cassette should run on PHLOOPY without problem.

And because PHLOOPY contains its own intelligent microprocessor – a second computer which does most of the hard work – PHLOOPY puts very



little load on the BBC and uses much less RAM than most disk systems.

Installing PHLOOPY on your BBC

You'll be amazed how simple it is to install PHLOOPY. Just plug in the interface cut two resistors (clearly marked in the instructions) and the job is done. If you should have problems our engineers are waiting to help you.

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PHLOOPY cartridges hold a full 100k of data or programs. Two of them come free with the drive and extra ones cost £3.75 each plus VAT. They are moulded of high impact polymers for protection and store easily on a bookshelf. Many programs will be available to purchase on PHLOOPY.

Phi Mag Systems Ltd.
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Telephone: (0326) 76040.

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YC

(continued from page 184)

to drop them into the volcano on the right. You have three men which can be lost by hitting the scenery, running out of time on each bombing run, being hit by either the bird or helicopter or by being struck by lightning. To make it more difficult, with each run, the scenery gets slightly more difficult.

Also the controls of the glider are difficult to master. Left or right is obtained by moving the joystick in the appropriate direction, but to go up or down you have to hit a thermal and they may not be where you want them. You get 100 points for each bomb that lands on target which is done by pressing the fire button. When all your men have been lost press the space bar to continue. The screen displays lives, score and time for each run.

If the task of typing in the program is too daunting it can be obtained from me for £4 at 3 Greenfield House, Greenfield Road, Colne.

Program 1.

```
1 POKE788,194:POKE37150,2:REM***(C) 1983***
2 REM**TITAN  S.WARE*
3 REM***BY L.W.BETTERIDGE***
4 PRINT"■":POKE36879,127:PRINT"■■■■■■■■DON'T TOUCH TAPE.
5 POKE36878,15:POKE36875,191:FORI=1TO50:NEXT:POKE36875,0
6 FORI=1TO3000:NEXT
7 POKE36879,25:PRINT"■■■■■"
8 POKE36878,15
9 PRINT"■  ┌─┐
10 PRINT"  │ │
11 PRINT"  │ │
12 PRINT"  ├─┐
13 PRINT"  │ │
14 PRINT"  ├─┤     ■SWOOSH(C)■ |  ||
15 PRINT"■]  └─┘ ■  ─────────■
16 PRINT"  ┌─
17 PRINT"  │
18 PRINT"  └──SOFTWARE
19 POKE36875,0
20 DATA215,1,228,.5,225,1,225,1.5,215,.5,228,1.5,225,.5,228,1.5,225,.5,209,5.5,2
15,1
21 DATA223,.5,219,1,219,1,223,1,221,.5,219,.5,215,1,215,1,219,1,217,.5,215,1,209
,.5
22 DATA225,1,225,1,225,3,195,1,207,1,215,.5,195,1.5,201,.5,203,1.5,215,.5,195,1.
5
23 DATA201,.5,207,4.5,-1,-1
24 READAA:READBB:IFAA=-1THEN26
25 POKE36875,AA:FORI=1TO250*BB:NEXT:POKE36875,0:GOTO24
26 POKE36869,242:PRINT"■■■■  \/■|_/¬|\/■":PRINT"■■■  ─────────
27 PRINT"■HE OBJECT IS TO PICK UP BOMBS FROM THE     MOUNTAIN TOP AND TO   DROP
 THEM
28 PRINT"■■■■■INTO THE VOLCANO.
29 PRINT" NFORTUNATELY YOU ONLYHAVE 35 SECONDS TO    DROP EACH BOMB.
30 PRINT"■O GAIN OR LOSE HEIGHTUSE THE THERMALS FROM THE  SCENERY  BELOW.
31 PRINT"■O ALTER DIRECTION USEJOYSTICK.TO DROP BOMBSUSE FIRE BUTTON.
32 PRINT"■■■■■■L"** */| /¯|
33 GETA$:IFA$=""THEN33
34 PRINT"■■■■■■L"**" O*\|    ":FORI=1TO1000:NEXT
35 DATA192,240,252,255,255,255,255,255
36 DATA0,0,0,0,192,240,252,255
37 DATA48,32,63,56,56,40,4,6
38 DATA32,32,224,32,32,32,40,56
39 DATA0,0,0,0,3,15,63,255
40 DATA3,15,63,255,255,255,255,255
41 DATA4,4,7,4,4,4,28,28
42 DATA12,4,252,28,28,60,32,96
43 DATA1,3,7,15,31,63,127,255
44 DATA128,192,224,240,248,252,254,255
45 DATA4,5,7,1,1,3,2,2
46 DATA32,160,224,128,128,224,64,64
47 DATA106,98,86,86,86,117,117,254
48 DATA169,165,85,85,149,149,181,189
49 DATA0,0,0,0,0,15,63,255
50 DATA0,0,0,0,0,240,252,255
51 DATA1,7,127,255,63,15,3,1
52 DATA128,224,254,255,252,240,192,128
53 DATA3,15,7,15,63,127,63,7
54 DATA192,240,224,240,252,254,252,224
55 DATA4,0,16,32,120,16,32,124
56 DATA56,207,207,56,56,24,15,14
57 DATA0,0,32,127,0,0,0,0
58 DATA3,15,47,127,0,0,0,0
59 DATA0,0,219,146,210,82,219,0
60 DATA0,0,187,170,187,178,171,0
61 DATA238,170,167,234,234,170,247,247
62 DATA60,102,90,90,126,129,255,129
63 DATA255,255,51,51,255,51,51,255
64 DATA42,62,28,28,28,28,28,0
65 DATA0,0,117,37,37,37,37,0
66 DATA0,0,87,244,183,20,23,0
67 DATA0,0,0,0,0,0,0,0
68 DATA255,255,255,255,255,255,255,255
69 DATA0,0,0,0,24,0,0,0
70 DATA56,56,56,56,56,56,56,56
71 DATA1,3,11,15,63,127,127,255
72 DATA128,128,196,240,252,252,254,255
73 DATA1,3,7,15,31,63,127,255
74 DATA128,192,224,240,248,252,254,255
75 DATA252,149,150,170,170,170,170,170
76 DATA191,175,251,251,250,238,238,239
77 DATA254,250,251,251,251,238,238,239
78 DATA84,16,16,137,162,168,32,0
79 DATA128,136,132,129,133,148,144,106
80 DATA0,0,171,250,219,138,139,0
81 DATA0,0,162,50,170,38,162,0
82 DATA0,0,0,0,0,0,0,0
83 DATA62,67,69,73,83,99,62,0
84 DATA4,4,4,4,12,12,12,0
85 DATA126,1,1,6,24,96,127,0
86 DATA126,2,2,30,3,3,127,0
87 DATA32,36,100,127,4,4,4,0
88 DATA63,32,32,30,1,33,30,0
89 DATA63,32,32,63,97,97,127,0
90 DATA126,2,2,2,3,3,3,0
91 DATA126,66,66,126,67,67,127,0
92 DATA126,66,126,3,3,3,0,-1
93 POKE36879,8
94 POKE36865,21
95 POKE36864,6
96 POKE36866,30
97 POKE36867,66
98 PRINT"■":FORI=7168TO8186:POKEI,32:NEXT
99 FORI=6144TO6655:POKEI,PEEK(I+26624):NEXT:I=6144
100 READA:IFA=-1THEN103
101 POKEI,A:I=I+1:GOTO100
102 POKE36878,PEEK(36878)AND15OR(80)
103 POKE36869,254
104 POKE56,24:POKE52,24
105 POKE36866,PEEK(36866)ANDNOT128
106 POKE36869,242
107 DATA120,169,0,141,20,3,169,***,141,21,3,88,96,169,0,141,19,145,141,34,145,17
3,17,145
108 DATA41,31,74,74,133,144,173,17,145,41,32,74,5,144,133,144
109 DATA173,32,145,41,128,74,74,74,74,5,144,73,31,133,144,169,255,141,34,145,76,
191,234
110 DATA234
111 S=673:FORI=0TO63:READA$
112 IFA$="***"THENPOKES+I,(S+13)/256:POKES+I-5,(S+13)AND255:NEXT
113 POKEI+S,VAL(A$):NEXT
114 POKE36878,15:POKE36875,191:FORI=1TO50:NEXT:POKE36875,0:POKE36879,104
115 PRINT"■■■■■■■        LOADING TIME":PRINT"■":FORI=1TO3000:NEXT
116 POKE198,3:POKE632,147:POKE633,131
```

Program 2.

```
1 LI=3:POKE36879,232:T=7798:P=1:POKE36878,9:ZZ=7678:GOTO62
2 T=T-1:IFPEEK(T)<>32THENPOKEY+1,32:POKEY+30,32:POKET,32:GOTO90
3 POKEQ,32:POKET,5:P=P*-1:IFT=7768THENT=7798:POKET-30,32
4 S=22:Q=T:POKET+C,15:IFP=-1THENS=23
5 RETURN
6 POKEQ1,32:ZZ=ZZ-1:IFPEEK(ZZ)<>32THENPOKEY+1,32:POKEZZ,32:GOTO90
7 POKEZZ,43:IFZZ=7648THENZZ=7678:POKEZZ-30,32
8 Q1=ZZ:POKEZZ+C,10:RETURN
9 H=Y:Y=Y-30:POKEH+61,32:POKEH+30,32:POKEH+31,32:IF(PEEK(Y)ORPEEK(Y+1))<>32THEN9
0
10 IFTI$=>"000035"THEN90
11 IFR=1ANDRND(9)>.9THENGOTO110
12 R=0:POKE36877,INT(V/33):IFU=1THENPOKEH+60,32:POKEH+61,32:POKEH+30,32:POKEH+31
,32
13 POKEY+31+C,6:POKEY+1+C,2
14 POKEY,O1:POKEY+C,2:POKEY+1,O2:POKEY+30,M:POKEY+30+C,N:POKEY+31,K:POKEY+31+C,L
15 IFU=1ANDG=1THENPOKEY+61,29
16 POKE36877,INT(V/33):IFU=1ANDG=-1THENPOKEY+60,29
17 IFSTICKAND8THENM=2:N=1:K=3:L=0:O1=0:O2=1:G=1:POKEY,32:POKEY+1,32:GOTO61
18 IFSTICKAND4THENM=6:N=0:K=7:L=1:O1=4:O2=5:G=-1:POKEY,32:POKEY+1,32:GOTO61
19 IFU=0ORG<>1THEN21
20 IFSTICKAND16THENJ=H+31:GOTO102
21 GOSUB2:GOSUB6:GOTO9
22 H=Y:Y=Y+30:IFU=0AND(PEEK(Y+30)ORPEEK(Y+31))<>32THENPOKEY-30,32:POKEY-29,32:GO
TO90
23 IFU=1AND(PEEK(Y+60)ORPEEK(Y+61))<>32THENPOKEY-30,32:POKEY-29,32:GOTO90
24 POKEH+30+C,6:POKEY+31+C,6:POKEY,32:POKEY+1,32:POKEY+C,2:IFTI$="000035"THEN90
25 POKEY,O1:POKEY+30+C,N:POKEY+30,M:POKEY+31+C,L:POKEY+31,K
26 POKE36877,INT(Y/33):POKEY+1+C,2:POKEY+1,O2:BB=0
27 IFU=1ANDG=1THENPOKEY+61,29:POKEY+C+61,0
28 IFU=1ANDG=-1THENPOKEY+60,29:POKEY+60+C,0
29 IFSTICKAND8THENM=2:N=1:K=3:L=0:O1=0:O2=1:G=1:POKE1-/,32:POKEY,32:POKEY+30,32
:BB=1
30 IFSTICKAND4THENM=6:N=0:K=7:L=1:O1=4:O2=5:G=-1:POKEY+1,32:POKEY,32:POKEY+31,32
:BB=1
31 IFBB=1ANDU=1THENPOKEY+60,32:POKEY+61,32:GOTO61
32 IFBB=1THENGOTO61
33 POKEY-30,32:POKEY-29,32:POKEY,32:POKEY+1,32:GOSUB2:GOTO22
34 LI=3:POKE7864,32:POKE7834,32:POKE7774,32:POKE7503,32:POKE7502,32:POKE7474,32
35 POKE7473,32:PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■!!!!!!!!!":ZZ=7678
36 POKEV,32:POKEY+1,32:POKE36878,9
37 Y=7708:C=30720:M=2:N=1:K=3:L=0:B=7941:G=1:O2=1:O1=0:U=0:TI$="000000":R=0
38 POKEB,29:POKEB+C,0:T=7798:P=1
39 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■"RIGHT$(TI$,4):PRINT"■■■■"LI:PRINT"■■■■■■■■■■"S
C
40 POKEH,32:POKEH+30,32:POKEH+1,32:POKEH+31,32:IFTI$>="000035"THEN90
41 IFG=1ANDU=1AND(PEEK(Y+61))<>32THEN90
42 IFG=-1AND(PEEK(Y)ORPEEK(Y+30))<>32THEN90
43 IFG=-1ANDU=1AND(PEEK(Y+59))<>32THEN90
44 IFG=1AND(PEEK(Y+61)=29)THENU=1
45 IFG=-1AND(PEEK(Y+60)=29)THENU=1
46 IFG=1AND(PEEK(Y+1)ORPEEK(Y+31))<>32THEN90
47 IFU=1ANDG=-1THENPOKEH+60,32
48 IFU=1ANDG=1THENPOKEH+61,32
49 POKEY,O1:POKEY+C,2:POKEY+1,O2:POKEY+1+C,2:POKEY+30,M
50 POKEY+30+C,N:POKEY+31,K:POKEY+31+C,L:IFU=1ANDG=-1THENPOKEY+60,29:POKEY+60+C,0
51 H=Y:SYS673:IFU=1ANDG=1THENPOKEY+61,29:POKEY+61+C,0
52 IFSTICKAND4THENM=6:N=0:K=7:L=1:O1=4:O2=5:G=-1:IFU=1THENPOKEY+61,32
53 IFSTICKAND8THENM=2:N=1:K=3:L=0:O1=0:O2=1:G=1:IFU=1THENPOKEY+60,32
54 IF((Y-7174)/30)=INT((Y-7174)/30)THEN9
55 GOSUB2
56 IF((Y-7170)/30)=INT((Y-7170)/30)THEN9
57 IF((Y-7186)/30)=INT((Y-7186)/30)ANDY>7400THENR=1:GOTO9
58 IF((Y-7190)/30)=INT((Y-7190)/30)THEN9
59 IF((Y-7193)/30)=INT((Y-7193)/30)THENPO=1:GOTO9
60 IF((Y-7177)/30)=INT((Y-7177)/30)THEN22
61 Y=Y+0:GOTO39
62 PRINT"■":POKE36869,254:B=30720:DATA7213,18,1,7253,16,1,7291,17,1
63 I=7168:FORT=ITOI+26:POKET,33:POKET+B,1:NEXT:I=7198:FORT=I+15TOI+26:POKET,33
64 POKET+B,1:NEXT:I=7228:FORT=I+25TOI+29:POKET,33:POKET+B,1:NEXT
65 DATA7290,16,1,7325,19,1,7354,19,1,7420,16,0,7427,17,0:I=7290
66 I=7319:FORT=ITOI+6:POKET,33:POKET+B,1:NEXT:I=7350:DATA7319,18,1,7350,16,1
67 FORT=ITOI+4:POKET,33:POKET+B,1:NEXT:I=7400:FORT=I+13TOI+18:POKET,33:POKET+B,0
:NEXT
68 DATA7450,16,0,7456,19,0,7481,18,0,7485,19,0,7488,20,7:I=7451
69 FORT=ITOI+5:POKET,33:POKET+B,0:NEXT:I=7482:FORT=ITOI+3:POKET,33:POKET+B,0:NEX
T
70 DATA7510,20,7,7512,34,1,7515,20,7,7532,16,1,7540,20,7,7721,34,1
71 DATA7533,33,1,7534,17,1,7562,18,1,7564,17,1,7571,34,1,7563,33,1,7721,34,1
72 DATA7830,21,0,7850,21,0,7854,21,0,7884,21,0,7894,21,0,7871,27,2,7876,21,0,788
3,21,1
73 DATA7894,35,2,7906,35,2,7890,35,2,8078,45,1,8079,46,1,7910,35,2,7913,12,10,79
14,13
74 DATA10,7896,36,0,7903,37,0,7912,36,0,7915,37,0:I=7897:FORT=ITOI+5:POKET,37:PO
KET+B,0
75 NEXT:DATA7920,35,0,7921,39,0,7922,33,0,7923,39,0,7925,36,5,7934,37,5
76 I=7910:FORT=I+8TOI+15:POKET,33:POKET+B,5:NEXT
77 DATA7936,35,0,7937,38,0,7939,39,0,7940,35,0,7941,36,0,7938,33,0,7942,33,0
78 FORT=I+24TOI+29:POKET,33:POKET+B,5:NEXT
79 DATA7948,37,5,7950,33,0,7951,28,0,7952,28,0,7953,28,0,7954,33,0,7956,33,5,796
6,33,0
80 I=7940:FORT=I+9TOI+23:POKET,33:POKET+B,5:NEXT
81 DATA7967,28,2,7968,28,2,7969,28,2,7970,33,0,7966,33,0,7965,37,5,7943,42,10,79
44,41
82 DATA10,7932,40,13,7920,40,13,7929,40,13,7972,40,13
83 POKEI-3+B,0:POKEI-2+B,0:POKEI-1+B,0
84 DATA7996,33,0,8000,33,0,7997,28,2,7998,28,2,7999,28,2,7987,17,5
85 DATA7955,33,0,7924,35,0,8015,19,5,8022,18,5,8069,30,1,8070,31,1,8083,24,1,808
4,25,1
86 I=8009:FORT=I+8TOI+13:POKET,32:POKE(T-28),32:NEXT
87 DATA7994,18,5,-1,-1,-1
88 READA:READD:READC:IFA=-1THEN37
89 POKEA,D:POKEA+B,C:GOTO88
90 POKE36877,0:FORM=1TO40:NEXT
91 POKE36878,15:POKE36877,220:FORL=15TO0STEP-1:POKE36878,L
92 GOSUB98
93 IFU=1THENPOKEH+60,32:POKEH+61,32
94 IFPEEK(H-30)=0ORPEEK(H-30)=4THENPOKEH-30,32
95 IFPEEK(H-29)=0ORPEEK(H-29)=4THENPOKEH-29,32
96 POKEH,82:POKEH+C,10:POKEH+1,78:POKEH+1+C,9:POKEH+30,83:POKEH+30+C,10:POKEH+31
,86
97 POKEH+31+C,10:NEXTL
98 POKEH,32:POKEH+1,32:POKEH+30,32:POKEH+31,32
99 POKEQ,32:IFL>0THENRETURN
100 POKE36878,9:LI=LI-1:IFLI=0THENSC=0:POKEZZ,32:WAIT197,32:RUN34
101 GOTO37
102 FORBD=230TO128STEP-1:POKE36876,BD:POKEJ,32:J=J+30:IFPEEK(J)<>32THEN104
103 POKEJ,29:FORT=1TO10:NEXTT:NEXTBD
104 FORBD=15TO0STEP-1:POKE36877,BD*15:FORT=1TO10:NEXTT:POKE36878,BD:POKE36877,20
0:NEXTBD
105 POKE36876,0:U=0:IFPO=1THENSC=SC+100:PO=0:POKE7864,21:POKE7864+C,1
106 IFSC>600THENPOKE7834,21:POKE7834+C,0
107 IFSC>900THENPOKE7503,17:POKE7503+C,1:POKE7502,16:POKE7502+C,1
108 IFSC>1200THENPOKE7474,17:POKE7474+C,1:POKE7473,16:POKE7473+C,1
109 POKE36879,232:GOTO36
110 FORR=7486TO7546STEP30:POKER,20:POKER+C,7:POKE36876,241:POKE36876,0
111 NEXTR:FORR=7546TO7486STEP-30:POKER,32:NEXTR:GOTO9
```

Roulette

A P Brooks,
Warrington,
Cheshire.



THIS GAME IS a version of the casino game Roulette for the Amstrad CPC-464. Full instructions and a list of all the main key terms are listed in the program.

The program makes good use of locomotive Basic and also includes the tune *The Entertainer.*

```
10 MODE 0:BORDER INT(RND(1)*27),INT(RND(1)*27):FOR a=2
 TO 15:INK a,INT(RND(1)*25)+1,INT(RND(1)*27):NEXT:INK
0,0:INK 1,26:PEN 1:PRINT
"      ROULETTE":PRINT:PRINT
20 FOR a=2 TO 15 STEP 2:PEN a:PRINT"ROULETTE":PEN a+1:
PRINT"          ROULETTE":NEXT     ""
30 READ A:IF A=-1 THEN 50
40 SOUND 1,A,23,15:GOTO 30
50 PEN 1:LOCATE 1,21:PRINT"     DO YOU WANT     INSTRU
CTIONS (Y/N)"
60 a$=UPPER$(INKEY$):IF a$<>"Y" AND a$<>"N" THEN 60
70 IF a$="N" THEN 100 ELSE 1900
80 DATA 239,201,190,119,0,190,119,190,119,119,119,119,
0,119,106,100,95,119,106,95,0,127,106,0,119,119,119,11
9,119,213,201,190,119,0,
119,0,190,119,119,119,119,119,0,142,159,169,142,119,95
,0,106,119,142,106,106,106,106,0,0,213,201
90 DATA 190,119,0,190,119,0,190,119,119,119,119,0,119,
106,100,95,119,106,95,0,127,106,0,119,119,119,119,119,
0,119,106,95,119,106,95,
0,119,106,119,95,119,106,95,0,119,106,119,95,119,106,9
5,0,127,106,0,119,119,119,119,-1
100 INK 0,26:BORDER 19:INK 1,0:INK 2,3:INK 3,12:MODE 1

110 DIM a(36,6),n(12):mo=500:z=360/37:bor=5000
120 SYMBOL AFTER 200:SYMBOL 200,124,198,206,214,230,19
8,124,0:SYMBOL 201,0,4,4,4,4,4,4,0:SYMBOL 202,255,251,
245,253,251,247,241,255:
SYMBOL 203,0,6,1,1,6,1,1,6:SYMBOL 204,255,253,249,245,
240,253,253,255
130 SYMBOL 205,0,14,8,14,1,1,14,0:SYMBOL 206,255,249,2
47,241,246,246,249,255:SYMBOL 207,0,14,2,4,8,8,8,0:SYM
BOL 208,255,249,246,246,
249,246,246,249:SYMBOL 209,0,6,9,9,7,1,6
140 SYMBOL 210,255,208,214,214,214,214,208,255:SYMBOL
211,255,221,221,221,221,221,221,255:SYMBOL 216,0,36,42
,34,36,40,46,0:SYMBOL 21
8,0,34,38,42,47,34,34,0
150 SYMBOL 217,255,217,222,222,217,222,222,217:SYMBOL
219,255,209,215,209,222,222,209,255:SYMBOL 220,0,38,40
,46,41,41,38,0:SYMBOL 22
1,255,209,221,219,215,215,215,255
160 SYMBOL 222,0,38,41,41,38,41,41,38:SYMBOL 223,0,38,
41,41,39,33,38,0:SYMBOL 224,255,176,86,214,182,118,16,
255:SYMBOL 226,255,187,8
5,221,187,119,17,255
170 SYMBOL 228,255,189,89,213,176,125,29,255:SYMBOL 23
0,255,185,87,209,182,118,25,255:SYMBOL 225,0,68,164,36
,68,132,228,0:SYMBOL 227
,0,70,161,33,70,129,225,6:SYMBOL 229,0,78,168,46,65,12
9,238,0
180 SYMBOL 232,0,78,162,36,72,136,232,0:SYMBOL 233,255
,185,86,214,185,118,22,249:SYMBOL 234,255,185,86,214,1
84,126,25,255:SYMBOL 235
,0,207,41,41,201,41,47,192:SYMBOL 237,0,196,42,34,196,
40,46,197
190 SYMBOL 239,0,194,38,42,207,34,34,192:SYMBOL 241,0,
198,40,46,201,41,38,197
200 SYMBOL 236,255,59,219,219,59,219,219,63:SYMBOL 238
,255,57,222,222,57,222,222,57:SYMBOL 240,255,49,215,20
8,62,222,209,63
210 DEG:b=0:FOR a=1 TO 360 STEP z:a(b,2)=490+121*SIN(a
):a(b,3)=260+121*COS(a):b=b+1:NEXT
220 FOR a=0 TO 36:READ a(a,0),a(a,1),a(a,6):NEXT
230 DATA 1,0,200,3,32,201,2,15,202,3,19,203,2,4,204,3,
21,205,2,2,206,3,25,207,2,17,208,3,34,209,2,6,210,2,27
,211,3,13,216,2,36,217,3
,11,218,2,30,219,3,8,220,2,23,221,3,10,222,3,5,223,2,2
4,224,3,16,225,2,33,226,3,1,227,2,20,228
240 DATA 3,14,229,2,31,230,3,9,232,2,22,233,2,18,234,3
,29,235,2,7,236,3,28,237,2,12,238,3,35,239,2,3,240,3,2
6,241
250 FOR a=0 TO 36:READ a(a,5),a(a,4):NEXT
260 DATA 1,4,2,3,2,4,2,5,3,3,3,4,3,5,4,3,4,4,4,5,5,3,5
,4,5,5,6,3,6,4,6,5,7,3,7,4,7,5,8,3,8,4,8,5,9,3,9,4,9,5
,10,3,10,4,10,5,11,3,11,
4,11,5,12,3,12,4,12,5,13,3,13,4,13,5
270 FOR a=0 TO 400 STEP 2:PLOT 0,a,1:DRAW 640,a:NEXT:P
RINT CHR$(22)+CHR$(1)
280 WINDOW #1,1,8,1,14:WINDOW #2,10,20,3,3:WINDOW #3,2
,22,16,25:WINDOW #4,10,22,5,12:PEN 2:LOCATE 23,20:PRIN
T"WRITTEN & DESIGNED":PE
N 3:LOCATE 30,22:PRINT"BY..":PEN 0:LOCATE 27,24:PRINT"
The Wizard":WINDOW #5,15,16,14,14
290 CLS #1:CLS #2:CLS #3:CLS #4:CLS #5
300 PRINT CHR$(22)+CHR$(0):TAG:DEG:b=0:FOR a=1 TO 360
STEP z:PLOT 498,252,0:DRAW 490+121*SIN(a),260+121*COS(
a):PLOT -10,-10,a(a(b,1)
,0):MOVE 490+121*SIN(a),260+121*COS(a):PRINT CHR$(a(a(
b,1),6));:b=b+1:NEXT:TAGOFF
310 PLOT 640,115,0:DRAW 360,115:DRAW 360,400:LOCATE 11
,1:PEN 1:PRINT CHR$(246)+"ROULETTE"+CHR$(247):PLOT 318
,370,1:DRAW 318,400:CLS
#3:CLS #4:PRINT#4,"    ";CHR$(193);"PRESS";CHR$(192):PR
INT#4:PRINT#4,"A-J To Gamble"
320 PRINT#4,"Q to Quit":PRINT#4:PRINT#4,"L to Borrow":
PLOT 0,0,1:DRAW 600,0:GOTO 490
330 CLS #1:PRINT CHR$(22)+CHR$(0):PEN 1:LOCATE 1,2:PRI
NT" H  L":PRINT" I  O":PRINT" G  W":PRINT" H":PRINT
" O  E":PRINT" D  V":P
RINT" D  E":PRINT"     N ":PRINT:PEN 2:PRINT CHR$(214
);CHR$(215);:PEN 3:PRINT"  "CHR$(214);CHR$(215);
340 PRINT:PEN 2:PRINT CHR$(213);CHR$(212);:PEN 3:PRINT
"  "CHR$(213);CHR$(212):PEN 1:PRINT:PRINT"  123DMP"
350 FOR a=0 TO 36:PEN a(a,0):LOCATE a(a,4),a(a,5):PRIN
T CHR$(a(a,6));:NEXT:PLOT 0,0,1:DRAW 0,398:DRAW 135,398
:PLOT 0,320:DRAW 135,320
:PLOT 0,384:DRAW 135,384:PLOT 0,256:DRAW 135,256:PLOT
0,192:DRAW 185,192:PLOT 31,400:DRAW 31,170:PLOT 80,170
:DRAW 80,400
360 RETURN
370 GOSUB 330:CLS #5
380 x=INT(RND(1)*36)+36:y=INT(RND(1)*30)+7
390 TAG:PLOT -10,-10,1:MOVE a(y,2),a(y,3):PRINT CHR$(2
31);
400 IF x<=1 THEN TAGOFF:GOSUB 1870
410 FOR t=1 TO 111-(x*3):NEXT
420 PLOT -10,-10,a(a(y,1),0):MOVE a(y,2),a(y,3):PRINT
CHR$(a(a(y,1),6));
430 IF x<=1 THEN TAGOFF:RETURN
440 y=y+z:x=x-1:SOUND 1,87,5,15
450 IF y>36 THEN y=y-36
460 IF y>36 THEN y=y-36
470 IF y>36 THEN y=y-36
480 GOTO 390
490 CLS #3:PEN #3,1:PRINT#3,"A en plien          B a
cheval          C transversale pleineD en carre
    E transversal six
 F a column          G a dozen          H high or
low       I red or yellow      J odd or even"
500 PLOT 0,0,1:DRAW 400,0:IF mo>bo*2 THEN mo=mo-bo:bor
=bor+bo:bo=0
510 PRINT#2,"$";RIGHT$(STR$(mo),LEN(STR$(mo))-1):GOSUB
 330
520 a$=UPPER$(INKEY$):IF a$="" THEN 520
530 a=ASC(a$)-64:IF a<1 THEN 520
540 ON a GOTO 590,700,850,970,1100,1220,1340,1470,1600
,1730
550 IF a$="Q" THEN INK 0,0:INK 1,26:PEN 1:MODE 1:BORDE
R INT(RND(1)*28):END
560 IF a$="L" THEN 2130
570 IF mo>5000000 THEN 2160
580 GOTO 520
590 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 en plien"
600 PEN #3,1:PRINT#3,"You can only bet on  one number.
"
610 INPUT#3,"How much do you bet ";a
620 IF a>mo OR a<0 THEN GOSUB 1860:GOTO 590
630 INPUT#3,"Which number do you  wish to bet on";n
640 IF n>36 OR n<0 OR n<>INT(n) THEN GOSUB 1860:GOTO 5
90
650 CLS #3:PLOT 0,0:DRAW 400,0:PEN #3,2:PRINT#3,"
 en plien"
660 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on"n
670 PEN 1:LOCATE a(n,4),a(n,5):PRINT CHR$(144);GOSUB 3
80
680 IF n=a(v,1) THEN mo=mo+(35*a) ELSE mo=mo-a
690 GOTO 490
700 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 a cheval"
710 PEN #3,1:PRINT#3,"You can only bet on  two numbers
 either   horizontally or      vertically"
720 INPUT#3,"How much do you bet ";a
730 IF a>mo OR a<0 THEN GOSUB 1860:GOTO 700
740 INPUT#3,"Which numbers do you wish to bet on";n,o
750 IF n<0 OR o<0 OR n>36 OR o>36 THEN GOSUB 1860:GOTO
 700
760 IF (o=0 AND (n=2 OR n=1)) OR (n=0 AND(o=2 OR o=1))
 THEN 800
770 FOR a=1 TO 37 STEP 3:IF (n=a AND o=a+1) OR (o=a AN
D n=a+1) OR (n=a+1 AND o=a+2) OR (o=a+1 AND o=a+2) THE
N 800 ELSE NEXT
780 IF o=n-3 OR o=n+3 THEN 800 ELSE GOSUB 1860:GOTO 70
0
790 GOSUB 1860:GOTO GOTO 700
800 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 a cheval"
810 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on"n"&"o
820 PEN 1:LOCATE a(n,4),a(n,5):PRINT CHR$(144);LOCATE
a(o,4),a(o,5):PRINT CHR$(144);GOSUB 380
830 IF n=a(v,1) OR o=a(v,1) THEN mo=mo+(17*a) ELSE mo=
mo-a
840 GOTO 490
850 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3," tran
saversale pleine "
860 PEN #3,1:PRINT#3,"You can bet on any   row of numb
ers"
870 INPUT#3,"How much do you bet ";a
880 IF a>mo OR a<0 THEN GOSUB 1860:GOTO 850
890 INPUT#3,"Input the left-most number";n
900 IF n<1 OR n>34 THEN GOSUB 1860:GOTO 850
910 FOR a=1 TO 36 STEP 3:IF a=n THEN 920 ELSE NEXT:GOS
UB 1860:GOTO 850
920 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3," tran
saversale pleine"
930 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on"n;n+1
;n+2
940 PEN 1:LOCATE a(n,4),a(n,5):PRINT CHR$(144);LOCATE
a(n+1,4),a(n+1,5):PRINT CHR$(144);LOCATE a(n+2,4),a(n+
2,5):PRINT CHR$(144);GOS
UB 380
950 IF n=a(v,1) OR n+1=a(v,1) OR n+2=a(v,1) THEN mo=mo
+(11*a) ELSE mo=mo-a
960 GOTO 490
970 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 en carre"
980 PEN #3,1:PRINT#3:PRINT#3," Bet on four numbers arr
anged in a square"
990 INPUT#3,"How much do you wish to bet";a
1000 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 970
1010 INPUT#3,"What is the top-left number";n
1020 IF n<0 OR n>32 OR n<>INT(n) THEN GOSUB 1860:GOTO
970
1030 FOR a=3 TO 36 STEP 3:IF n=a THEN GOSUB 1860:GOTO
970 ELSE NEXT
1040 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
  en carre"
1050 IF n=0 THEN n(1)=1:n(2)=2:n(3)=3 ELSE n(1)=n+1:n(
2)=n+3:n(3)=n+4
1060 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on"n;n(
1);n(2);n(3)
1070 PEN 1:LOCATE a(n,4),a(n,5):PRINT CHR$(144);LOCATE
 a(n(1),4),a(n(1),5):PRINT CHR$(144);LOCATE a(n(2),4),
a(n(2),5):PRINT CHR$(144
);LOCATE a(n(3),4),a(n(3),5):PRINT CHR$(144);GOSUB 380
1080 IF n=a(v,1) OR n(1)=a(v,1) OR n(2)=a(v,1) OR n(3)
=a(v,1) THEN mo=mo+(8*a) ELSE mo=mo-a
1090 GOTO 490
1100 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
transversal six"
1110 PEN #3,1:PRINT#3:PRINT#3," Bet on two adjacent ro
ws"
1120 INPUT#3,"How much do you wish to bet";a
1130 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 1100
1140 INPUT#3,"What is the first    number in the two
 rows";n
1150 IF n>36 OR n<1 OR n<>INT(n) THEN GOSUB 1860:GOTO
1100
1160 FOR a=1 TO 36 STEP 3:IF a=n THEN 1170 ELSE NEXT:G
OSUB 1860:GOTO 1100
1170 FOR a=1 TO 6:n(a)=(n-1)+a:NEXT:PEN #3,2:CLS #3:P
LOT 0,0:DRAW 400,0:PRINT#3,"    transversal six"
1180 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on";:FO
R a=1 TO 6:PRINT#3,n(a);:NEXT
1190 PEN 1:FOR a=1 TO 6:LOCATE a(n(a),4),a(n(a),5):PRI
NT CHR$(144);:NEXT:GOSUB 380
1200 FOR a=1 TO 6:IF a(v,1)=n(a) THEN mo=mo+(5*a) ELSE
 NEXT:mo=mo-a
1210 GOTO 490
1220 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
   coloman"
1230 PEN #3,1:PRINT#3:PRINT#3," Bet on one of three co
lomns"
1240 INPUT#3,"How much do you wish to bet";a
1250 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 1220
1260 INPUT#3,"Which coloman do you wish to bet on";n
1270 IF n>3 OR n<1 OR n<>INT(n) THEN GOSUB 1860:GOTO 1
220
1280 IF n=1 THEN FOR a=1 TO 36 STEP 3:n(INT(a/3)+1)=a:
NEXT ELSE IF n=2 THEN FOR a=2 TO 36 STEP 3:n(INT(a/3)+
1)=a:NEXT ELSE FOR a=3 T
O 36 STEP 3:n(INT(a/3))=a:NEXT
1290 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
   coloman"
1300 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on colo
mn"n
1310 PEN 1:IF n=1 THEN LOCATE 3,14:PRINT CHR$(144) ELS
E IF n=2 THEN LOCATE 4,14:PRINT CHR$(144) ELSE LOCATE
5,14:PRINT CHR$(144)
1320 GOSUB 380:FOR a=1 TO 12:IF n(a)=a(v,1) THEN mo=mo
+(2*a) ELSE NEXT:mo=mo-a
1330 GOTO 490
1340 PEN #3,2:CLS #3:PRINT#3,"        dozen"
1350 PEN #3,1:PRINT#3:PRINT#3," Bet on first dozen  ('
P' 1-12) or second dozen ('M' 13-24) or third dozen ('
D' 25- 36)"
1360 INPUT#3,"How much do you wish to bet";a
1370 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 1340
1380 PRINT#3:PRINT#3,"Which dozen do you   wish to bet
 on press P,M,D"
1390 a$=UPPER$(INKEY$):IF a$<>"P" AND a$<>"M" AND a$<>
"D" THEN 1390
1400 PEN 1:IF a$="P" THEN a$="first":FOR a=1 TO 12:n(a
)=a:NEXT:LOCATE 8,14:PRINT CHR$(144)
1410 IF a$="M" THEN a$="second":FOR a=13 TO 24:n(a-12)
=a:NEXT:LOCATE 7,14:PRINT CHR$(144)
1420 IF a$="D" THEN a$="third":FOR a=25 TO 36:n(a-24)=
a:NEXT:LOCATE 6,14:PRINT CHR$(144)
1430 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
   dozen"
1440 PEN #3,1:PRINT#3:PRINT#3," You have bet"a"on the
"a$" dozen"
1450 GOSUB 380:FOR a=1 TO 12:IF n(a)=a(v,1) THEN mo=mo
+(2*a) ELSE NEXT:mo=mo-a
1460 GOTO 490
1470 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 high or low"
1480 PEN #3,1:PRINT#3:PRINT#3," Bet on Low numbers  (1
-18) or High        numbers (19-36)"
1490 INPUT#3,"How much do you wish to bet";a
1500 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 1470
1510 PRINT#3:PRINT#3,"Which would you like to bet on p
ress L,H"
1520 a$=UPPER$(INKEY$):IF a$<>"L" AND a$<>"H" THEN 152
0
1530 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 high or low"
1540 PEN 1:IF a$="L" THEN LOCATE 7,3:PRINT CHR$(144) E
LSE LOCATE 1,3:PRINT CHR$(144)
1550 PRINT#3:PRINT#3,"you have bet"a"on ";:IF a$="L" T
HEN PRINT#3,"low" ELSE PRINT#3,"high"
1560 GOSUB 380:IF a(v,1)=0 THEN PRINT#3:PRINT#3:PRINT#
3,"    IMPRISONED"GOSUB 380:IF a(v,1)=0 THEN mo=mo-(0.
5*a):GOTO 490
1570 IF a$="L" AND a(v,1)<=18 THEN mo=mo+a:GOTO 490
1580 IF a$="H" AND a(v,1)>=19 THEN mo=mo+a:GOTO 490
1590 mo=mo-a:GOTO 490
1600 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
red or yellow"
1610 PEN #3,1:PRINT#3:PRINT#3," Bet on Red numbers  or
 yellow numbers"
1620 INPUT#3,"How much do you wish to bet";a
1630 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 1600
1640 PRINT#3:PRINT#3,"Which would you like to bet on p
ress R,Y"
1650 a$=UPPER$(INKEY$):IF a$<>"R" AND a$<>"Y" THEN 165
0
1660 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
red or yellow"
1670 PEN 1:IF a$="R" THEN LOCATE 2,10:PRINT CHR$(144)
ELSE LOCATE 6,10:PRINT CHR$(144)
1680 PRINT#3:PRINT#3,"you have bet"a"on ";:IF a$="R" T
HEN PRINT#3,"red" ELSE PRINT#3,"yellow"
1690 GOSUB 380:IF a(v,1)=0 THEN PRINT#3:PRINT#3:PRINT#
3,"    IMPRISONED"GOSUB 380:IF a(v,1)=0 THEN mo=mo-(0.
5*a):GOTO 490
1700 IF a$="R" AND a(a(v,1),0)=2 THEN mo=mo+a:GOTO 490
1710 IF a$="Y" AND a(a(v,1),0)=3 THEN mo=mo+a:GOTO 490

1720 mo=mo-a:GOTO 490
1730 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 odd or even"
1740 PEN #3,1:PRINT#3:PRINT#3," Bet on Odd numbers  or
 Even numbers"
1750 INPUT#3,"How much do you wish to bet";a
1760 IF a<0 OR a>mo THEN GOSUB 1860:GOTO 1730
1770 PRINT#3:PRINT#3,"Which would you like to bet on p
ress O,E"
1780 a$=UPPER$(INKEY$):IF a$<>"O" AND a$<>"E" THEN 178
0
1790 PEN #3,2:CLS #3:PLOT 0,0:DRAW 400,0:PRINT#3,"
 odd or even"
1800 PEN 1:IF a$="O" THEN LOCATE 1,8:PRINT CHR$(144) E
LSE LOCATE 7,8:PRINT CHR$(144)
1810 PRINT#3:PRINT#3,"you have bet"a"on ";:IF a$="O" T
HEN PRINT#3,"odd" ELSE PRINT#3,"even"
1820 GOSUB 380:IF a(v,1)=0 THEN PRINT#3:PRINT#3:PRINT#
3,"    IMPRISONED"GOSUB 380:IF a(v,1)=0 THEN mo=mo-(0.
5*a):GOTO 490
1830 IF a$="O" AND a(v,1)/2<>INT(a(v,1)/2) THEN mo=mo+
a:GOTO 490
1840 IF a$="E" AND a(v,1)/2=INT(a(v,1)/2) THEN mo=mo+a
:GOTO 490
1850 mo=mo-a:GOTO 490
1860 SOUND 1,2035,30,15:SOUND 1,0,10,15:SOUND 1,1017,6
0,15:RETURN
1870 PRINT CHR$(22)+CHR$(0):CLS #5:PEN a(a(v,1),0):LOC
ATE 15,14:PRINT RIGHT$(STR$(a(v,1)),LEN(STR$(a(v,1)))-
1)
1880 PRINT:PRINT CHR$(22)+CHR$(0):c=1:FOR a=1 TO 40:BO
RDER INT(RND(1)*28):SOUND 1,INT(RND(1)*4000),2,15:PEN
c:LOCATE a(a(v,1),4),a(a
(v,1),5):PRINT CHR$(a(a(v,1),6)):c=c+1:IF c>4 THEN c=
1
1890 FOR t=1 TO 30:NEXT:NEXT:BORDER 19:PRINT CHR$(22)+
CHR$(1):TAG:RETURN
1900 MODE 1:BORDER INT(RND(1)*27):INK 2,3,12:INK 3,20:
```

(continued on page 195)

Is this new F
another
First read th

The Ferguson TX MC01 has separate RGB, Composite Video and Aerial inputs: a choice of connections for computers, video games and video recorders. These provide the SHORTEST (and best) routes for computer and video signals to reach the tube. The loop aerial shows that the MC01 is also a portable colour TV. And there's automatic electronic switching between functions.

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(continued from page 190)

```
PEN 2:PRINT TAB(16)"ROULETTE"
1910 PEN 3:PRINT:PRINT:PRINT"Instructions":PRINT:PEN 1
:PRINT" This is a version of the famous casino game '
ROULETTE' in which you w
ill play  against the 'AMSTRAD CPC-464'+CHR$(161)+".Yo
u will  be given #500 to begin with."
1920 PRINT:PRINT" You can borrow up to #5000 when you
   have less than #50,there is no house    limit on g
ambleing but the bank wi
ll    break an #50 million."
1930 PRINT:PRINT:PRINT"      press any key for instruct
ions                on how to gamble."
1940 IF INKEY$="" THEN 1940
1950 CLS:PEN 2:PRINT TAB(16)"ROULETTE"
1960 PEN 3:PRINT:PRINT:PRINT"Instructions.":PRINT:PRIN
T"en plein":PEN 1:PRINT" bet on any on of the 37 numbe
rs         (including 0)
,the odds are 35-1."
1970 PEN 3:PRINT:PRINT"a cheval":PEN 1:PRINT" bet on t
wo either horizontally or       vertically adjacent nu
mber the odds are 17-1."
:PEN 3:PRINT:PRINT"transversale pleine":PEN 1:PRINT" b
et on a row of three numbers.You must"
1980 PRINT" enter the first of the three numbrs.    od
ds are 11-1":PRINT:PEN 3:PRINT"en carre":PEN 1:PRINT"
four numbers arranged on
 the table in   the shape of a square e.g. 7,8,10,11.
  The odds are 8-1":PEN 2
1990 LOCATE 1,25:PRINT"        press any key to continu
e":IF INKEY$="" THEN 1990
2000 CLS:PEN 2:PRINT TAB(16)"ROULETTE":PEN 3:PRINT:PRI
NT:PRINT"Instructions."
2010 PRINT:PRINT"transversal six":PEN 1:PRINT" bet on
two adjacent rows,and you must   input the first & low
est number in the  two r
ows,the odds are 5-1":PEN 3:PRINT:PRINT"a colomn":PEN
1
2020 PRINT" bet on of one three coloums of twelve   nu
mbers,the odds are 2-1":PRINT:PEN 3:PRINT"a dozen":PEN
 1:PRINT" bet on one of
three sets of twelve      numbers (1-12,13-24,25-36) t
he odds are 2-1":PRINT:PEN 3:PRINT"low or high":PEN 1
2030 PRINT" bet on either low numbers (1-18) or     hi
gh (19-36) the odds are 1-1":PEN 2:LOCATE 1,25:PRINT"
      PRESS ANY KEY TO C
ON"TNUE"
2040 IF INKEY$="" THEN 2040
2050 CLS:PEN 2:PRINT TAB(16)"ROULETTE":PEN 3:PRINT:PRI
NT:PRINT"Instructions."
2060 PRINT:PRINT"red or yellow":PEN 1:PRINT" bet on ei
ther red or yellow numbers the odds are 1-1":PRINT:PEN
 3:PRINT"odd or even":PE
N 1:PRINT" bet on odd numbers or even numbers the  odd
s are 1-1":PRINT:PEN 3:PRINT"Imprisoned":PEN 1
2070 PRINT" If you have bet on odd,even,red,yellow, hi
gh or low;and the ball lands on 0     then the bet is
IMPRISONED and the ball
is thrown again,if it again lands on 0  then the bank
takes half the bet."
2080 RESTORE
2090 READ A:IF A=-1 THEN 2110
2100 SOUND 1,A,23,15:GOTO 2090
2110 PEN 2:LOCATE 1,25:PRINT"            PRESS ANY KEY TO
 PLAY"
2120 IF INKEY$="" THEN 2120 ELSE 100
2130 IF mo>50 THEN 520
2140 CLS #3:PRINT#3,"   borrowing money":PRINT#3:PRINT
#3,"you can borrow up to"bor:INPUT #3,"how much do yo
u wish to borrow";m:IF m
>bor OR m<0 THEN 2140
2150 mo=mo+m:bor=bor-m:bo=m:GOTO 490
2160 CLS:MODE 0:PRINT:PRINT" You have broken the bank.
Would you like to start again (Y/N)"
2170 a$=UPPER$(INKEY$):IF a$<>"Y" AND a$<>"N" THEN 217
0
2180 IF a$="Y" THEN RUN
```

Quadruplets

Victor Card,
Horley,
Surrey.



QUADRUPLETS: a captivating game of vertical strategy in which the player tries to out-think the computer. The game is simple in concept but can develop into a challenging battle of tactics which makes quadruplets an absorbing game for all members of the family.

A modern, micro-based version of noughts and crosses the basic objective is to complete a line of four counters in the playing grid — vertically horizontally or diagonally — before the QL does the same. This sounds easy enough, but the computer makes sure that it's not. The limitations imposed by the vertical play of this game makes it necessary for the player to think ahead, or risk being out-manoeuvered by the micro.

At each turn, the counter is placed above the required column using the cursor keys. Pressing the spacebar will the drop the counter into the column selected until it comes to rest upon another counter or comes to rest upon the bottom of the grid. You should be careful not to press too long on the spacebar, however, since the QL has automatic repeat on all keys and a very effective keyboard buffer which can mean that you inadvertently play several goes ahead if you delay on the keys.

Although written in Basic, the program has been designed to make full use of the advanced graphics facilities of the QL and a reasonable fast and powerful game ensues. The human player always plays the green counters, and the computer always plays red. These colours have been selected to give effective displays on both colour and monochrome televisions and monitors. There are three optional skill levels and the previous loser always takes first go. The computer visually displays a winning line when one is achieved and keeps a running tally of the game score.

If typing in a program of this length proves too daunting a task then I can supply a copy on Microdrive cartridge for a cost of £7.50 including postage and packing. Please send all enquiries to Victor Card, 5 Cartersmead Close, Horley, Surrey RH6 9LG.

```
100 initialise
110 REPeat again
120 goes=0:CLS:CLS £2:DIM b(5,6)
130 FOR i=10 TO 130 STEP 20
140   FOR j=10 TO 110 STEP 20
150     INK 1:FILL 1:CIRCLE i,j,9
160   NEXT j
170 NEXT i
180 REPeat game
190 IF colour=4 THEN
200   colour=2
210   ELSE
220   colour=4
230 END IF
240 IF colour=4 THEN
250   humansgo
260   ELSE
270   QLsgo
280 END IF
290 check fours row,colour
300 IF winner=colour THEN
310   show winner:EXIT game
320 END IF
330 goes=goes+1
340 IF goes=42 THEN
350   INK £0,7:AT £0,1,5:PRINT £0,'stale mate':EXIT ga
me
360 END IF
370 END REPeat game
380 update score:offer_new_game
390 END REPeat again
400 REMark ********************
410 DEFine PROCedure initialise
420 REMark ********************
430 MODE 8:PAPER 1:CLS:INK 7:colmark=0
440 DIM column_score(6):DIM name$(8)
450 WINDOW 260,160,180,50:SCALE 120,-3,0
460 PAPER 0:CLS:BORDER 2,4
470 PAPER £0,1:CLS £0:CSIZE £0,2,1
480 WINDOW £2,150,160,30,50
490 PRINT "hello i'm QL"\\"what's your name"
500 INPUT name$
510 CLS:AT 1,4:PRINT "Let's play"
520 RESTORE
530 FOR i=1 TO 7
540   READ x,y,z
550   AT x,y:PRINT 'Q':AT x,z:PRINT 'L'
560 NEXT i
570 INK 6:FLASH 1
580 AT 8,6:PRINT 'uadrup':AT 8,13:PRINT 'ets'
590 DATA 5,8,9,6,7,10,7,6,11,8,5,12,9,6,11,10,7,10,11,
8,9
600 FLASH 0:FOR i=1 TO 5000:NEXT i:CLS
610 REPeat query
620   AT 8,1:PRINT "skill level (1-3)?"
630   skill$=INKEY$(-1)
640   IF skill$="1" OR skill$="2" OR skill$="3" THEN E
XIT query
650 END REPeat query
660 OPEN £8,scr_260x30a180x20:SCALE £8,120,-3,0
670 PAPER £8,1:CLS £8
680 QL_score=0:your_score=0:colour=2
690 END DEFine initialise
700 REMark ********************
710 DEFine PROCedure humansgo
720 REMark ********************
730 AT £2,5,0:PRINT £2,'use keys :-'\\;CHR$(188);' and
 ';CHR$(189)\'to move'\\'space bar'\'to play
740 x=80:y=50:col=0
750 INK £8,colour:FILL £8,1:CIRCLE £8,x,y,50
760 REPeat yourgo
770 a$=INKEY$(-1)
780 IF a$=" " AND b(0,col)=0 THEN
790   drop:EXIT yourgo
800 END IF
810 CLS £8
820 x=x+106*(CODE(a$)=200)-106*(CODE(a$)=192)
830 IF x<80 THEN x=80
840 IF x>716 THEN x=716
850 col=(x-80)/106
860 INK £8,colour:FILL £8,1:CIRCLE £8,x,y,50
870 END REPeat yourgo
880 END DEFine humansgo
890 REMark ***************
900 DEFine PROCedure drop
910 REMark ***************
920 CLS £8:row=0
930 REPeat until rest
940 INK colour:FILL 1:CIRCLE 10+col*20,110-row*20,9
950 IF row=5 THEN
960   b(row,col)=colour
970   END DEFine drop
980 END IF
990 IF b(row+1,col)<>0 THEN
1000   b(row,col)=colour
1010   END DEFine drop
1020 END IF
1030 FOR i=1 TO 100:NEXT i
1040 INK 1:FILL 1:CIRCLE 10+col*20,110-row*20,9
1050 row=row+1
1060 END REPeat until_rest
1070 END DEFine drop
1080 REMark ****************
1090 DEFine PROCedure QLsgo
1100 REMark ****************
1110 x=80:y=50:col=0:CLS £2
1120 find_best_move
1130 REPeat mygo
1140 FOR i=1 TO 100:NEXT i
1150 CLS £8
1160 IF (x-80)/106=col THEN
1170   drop:END DEFine QLsgo
1180 END IF
1190 x=x+106
1200 INK £8,colour:FILL £8,1:CIRCLE £8,x,y,50
1210 END REPeat mygo
1220 END DEFine QLsgo
1230 REMark **********************************
1240 DEFine PROCedure check_fours(row,mark)
1250 REMark **********************************
1260 winner=0
1270 search row,mark,0,1
1280 IF winner<>0 THEN
1290   rowmark=0:colmark=1
1300   END DEFine check_fours
1310 END IF
1320 search row,mark,-1,-1
1330 IF winner<>0 THEN
1340   rowmark=-1:colmark=-1
1350   END DEFine check_fours
1360 END IF
1370 search row,mark,1,-1
1380 IF winner<>0 THEN
1390   rowmark=-1:colmark=1
1400   END DEFine check_fours
1410 END IF
1420 search row,mark,1,0
1430 IF winner<>0 THEN
1440   rowmark=1:colmark=0
1450 END IF
1460 END DEFine check_fours
1470 REMark ******************************************
1480 DEFine PROCedure search(row,mark,deltax1,deltay1)
1490 REMark ******************************************
1500 count=1:points=1
1510 search1 row,mark,deltax1,deltay1
1520 search1 row,mark,-deltax1,-deltay1
1530 IF count>=4 THEN winner=colour
1540 END DEFine search
1550 REMark ******************************************
1560 DEFine PROCedure search1(row,mark,deltax,deltay)
1570 REMark ******************************************
1580 newrow=row:newcol=col:start=0
1590 REPeat look
1600 newrow=newrow+deltax
1610 IF newrow<0 OR newrow>5 THEN EXIT look
1620 newcol=newcol+deltay
1630 IF newcol<0 OR newcol>6 THEN EXIT look
1640 IF b(newrow,newcol)=colour THEN
1650   points=points+1
1660   IF start=0 THEN count=count+1
1670 END IF
1680 IF b(newrow,newcol)<>colour THEN
1690 start=1
1700   IF b(newrow,newcol)<>mark THEN EXIT look
1710   points=points+1
1720 END IF
1730 END REPeat look
1740 IF mark=0 AND points>=4 AND column_score(col)>1 T
HEN column_score(col)=column_score(col)+count-1
1750 END DEFine search1
1760 REMark ************************
1770 DEFine PROCedure show_winner
1780 REMark ************************
1790 endrow=row:endcol=col
1800 newrow=row:newcol=col
1810 REPeat endpoint
1820 newrow=newrow+rowmark
1830 IF newrow<0 OR newrow>5 THEN EXIT endpoint
1840 newcol=newcol+colmark
1850 IF newcol<0 OR newcol>6 THEN EXIT endpoint
1860 IF b(newrow,newcol)<>winner THEN EXIT endpoint
1870 endrow=newrow:endcol=newcol
1880 END REPeat endpoint
1890 FOR i=1 TO 20
1900 INK 1:flash_counters
1910 INK winner:flash_counters
1920 NEXT i
1930 END DEFine show_winner
1940 REMark **************************
1950 DEFine PROCedure flash_counters
1960 REMark **************************
1970 FOR j=0 TO count-1
1980 newrow=endrow-rowmark*j
1990 newcol=endcol-colmark*j
2000 x=10+20*newcol:y=110-20*newrow
2010 FILL 1:CIRCLE x,y,9
2020 END FOR j
2030 END DEFine flash_counters
2040 REMark **************************
2050 DEFine PROCedure find_best_move
2060 REMark **************************
2070 col=-1
2080 FOR i=0 TO 6:column_score(i)=2:NEXT i
2090 REPeat for_all_cols
2100 col=col+1
2110 IF col>6 THEN EXIT for_all_cols
2120 x=80+106*col:row=-1
2130 CLS £8:INK £8,colour:FILL £8,1:CIRCLE £8,x,y,50
2140 REPeat for_all_rows
2150 IF row>4 THEN EXIT for_all_rows
2160 IF b(row+1,col)<>0 THEN EXIT for_all_rows
2170 row=row+1
2180 END REPeat for_all_rows
2190 IF row=-1 THEN
2200   column_score(col)=-1
2210   NEXT for_all_cols
```

(continued on page 197)



A 96K PURE TEXT MACHINE CODE ADVENTURE FOR THE 48K SPECTRUM (IN TWO PARTS)

A large build up of Soviet troops is forming on the South Eastern Pakistan border, with probable hostile intentions. Troops and supplies travel the fragile Eastern Kabul road through unoccupied territory. Your role is to disrupt these troop movements, harass supplies and prevent the Soviets from attaining their objectives. You have British Paratroopers; ground to air missiles for attacking their airfield and destroying helicopters; plus rebel guerillas to lay ambush on troops and convoys.

Please send me .... copy(ies) of 'AFGHAN ATTACK' at £9.95 each. I enclose a cheque/P.O. made payable to 'Southern Software' to the value of ....

Name ....

Address ....

....

....

....

SOUTHERN SOFTWARE, 6 The Hillway, Fareham, Hants. PO16 8BL.

(continued from page 195)

```
2220 END IF
2230 b(row,col)=colour
2240 IF skill$<>'1' THEN
2250   check_fours row,0
2260   ELSE
2270   check_fours row,colour
2280 END IF
2290 IF winner=colour THEN
2300 b(row,col)=0
2310   CLS £8:column_score(col)=100
2320   END DEFine find_best_move
2330 END IF
2340 rowh=row-1
2350 IF rowh<>-1 THEN
2360   b(rowh,col)=colour
2370   check_fours rowh,colour
2380   IF winner=colour AND skill$='3' AND colmark<>0
THEN column_score(col)=1
2390   b(rowh,col)=0
2400   can_human_win rowh,4
2410   IF winner=4 THEN column_score(col)=0
2420 END IF
2430 can_human_win row,0
2440 IF winner=4 THEN column_score(col)=99
2450 colour=2:b(row,col)=0
2460 IF col=6 THEN EXIT for_all_cols
2470 END REPeat for_all_cols
2480 max=-1:n=0
2490 FOR i=0 TO 6
2500 IF column_score(i)=max THEN n=n+1
2510 IF column_score(i)>max THEN
2520   col=i:max=column_score(i):n=0
2530 END IF
2540 NEXT i
2550 IF n=0 THEN END DEFine find_best_move
2560 where=RND(n)
2570 FOR i=0 TO 6
2580 IF column_score(i)=max THEN
2590   where=where-1
2600   IF where=-1 THEN col=i
2610 END IF
2620 NEXT i
2630 END DEFine find_best_move
2640 REMark ************************************
2650 DEFine PROCedure can_human_win(rowh,mark)
2660 REMark ************************************
2670 colour=4:b(rowh,col)=colour
2680 check_fours rowh,mark
2690 b(rowh,col)=0
2700 END DEFine can_human_win
2710 REMark ************************
2720 DEFine PROCedure update_score
2730 REMark ************************
2740 IF winner=2 THEN QL_score=QL_score+1
2750 IF winner=4 THEN your_score=your_score+1
2760 CLS £0:PRINT £0," SCORE     QL ";QL_score,name$;
" ";your_score
2770 END DEFine update_score
2780 REMark *************************
2790 DEFine PROCedure offer_new_game
2800 REMark *************************
2810 REPeat question
2820 CLS £2
2830 AT £2,8,0:PRINT £2,"do you want"\"another go?"\"
yes or no"
2840 a$=INKEY$(-1)
2850 IF a$="Y" OR a$="y" THEN EXIT question
2860 IF a$="N" OR a$="n" THEN STOP
2870 END REPeat question
2880 CLS £8
2890 END DEFine offer_new_game
```

Hard Lines

Nigel Bates,
Bradford,
West Yorkshire.



THIS PROGRAM has been written on a 48K ZX Spectrum but will run on both 16K and 48K machines. The machine code is stored in data statements from line 30 to line 110 and is Poked into memory by line 10 and line 100, the machine code is used to move and display the scores and the ink jet.

The rest of the program is in Basic and controls the number of lives, screen number, screens, bonus and high scores. It makes full use of the 16K of memory, colour, sound, high resolution graphics and includes four different screens.

Program notes.

lines	10-110	Pokes machine code into memory
	998-1000	Initialises game
	1000-1020	Initialises go and calls the machine code
	1020-1160	Selects bonus
	2000-2070	Sub routine to draw screens
	2100-2499	Data for screens

Variables.

h$	Highscore	(6 digits)
a$	Score	(6 digits)
b$	Bonus	(4 digits)
c$	Messages	
l	Lives	
s	Level or Screen	

Other variables have misellaneous uses — a,b,x,y and n$.

Just type in the program as listed and run. To save use

SAVE "Hard Lines"

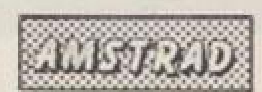
The program uses either the Sinclair Interface 2 or the keys: 6 Left; 7 Right; 8 Down; 9 Up; 0 Accelerate.

Guide the ink jet around the maze to try and reach the centre without hitting either the walls of the maze or your trail. You have a limited ink supply and are timed, if you can reach the centre before your time reaches 600 then you are awarded a bonus of 1,000 points plus a 500 point bonus for reaching the centre dot. If you complete a maze you are confronted with a new maze, there are four different screens and then it returns to the first screen.

```
   1 LET h$="000000"
   5 BORDER 0: PAPER 0: INK 7: B
RIGHT 1
  10 RESTORE : FOR a=32256 TO 32
450: READ n: POKE a,n: NEXT a
  20 LET c$=""
  30 DATA 30,23,1,8,174,62,248,2
11,254,33,255,125,62,239,219,254
,230,30,254,30,32,1,123,95,203,1
03,32,1,13,203,95,32,1,12,203,87
,32,1,4,203,79,32,1,5,86,62,0,21
1,27-,62,239,219,254
  32 DATA 203,71,32,7,53,32,1,52
,21,40,4,52,21,32,241,203,71,32,
3,53,32,1,52,62,64,136,48,2,6,1,
120,254,0,32,2
  34 DATA 6,191,197,120,205,177,
34,71,4,62,1,15,16,253,193,86,18
2,119,186,200,197,1,48,5,58,120,
92,33,255,127,190,40,15,119,43,5
2,62,22,215,62,1,215,62,31,215,2
05,0,127,1,48,6,33,247,127,52,62
,22,215,62,0,215,62,11,215,205,0
,127
  35 DATA 193,33,254,125,53,32,2
1,54,8,197,43,70,14,0,229,120,20
5,177,34,54,129,225,193,52,62,17
5,190,200
  39 DATA 62,251,219,254,203,95,
194,5,126,201
 100 RESTORE 110: FOR a=32512 TO
 32536: READ n: POKE a,n: NEXT a
 110 DATA 126,214,10,32,5,43,52,
35,24,2,198,10,119,129,215,62,8,
215,62,8,215,43,16,232,201
 998 POKE 32253,0: FOR a=32750 T
O 32767: POKE a,a-a: NEXT a
 999 LET l=INT PI: LET s=l/l
1000 INK RND*4+INT PI: CLS : PLO
T s,1
1001 FOR a=l-l TO 21: PRINT "█";
 NEXT a: GO SUB 2000
1002 FOR a=32760 TO 32766: POKE
a,a-a: NEXT a: POKE 32253,a-a: P
LOT 128,88: DRAW 2,a-a: DRAW a-a
,-2: DRAW -2,a-a: DRAW a-a,2
1010 PRINT AT s-s,2; INK 6; PAPE
R 1;"HARD LINES    By NIGEL BATE
S";#1;AT s-s,s-s; PAPER 2;"SCORE
:          HIGH SCORE:"; PAPER 1;
 INK 7;h$;"LIVES ";l;AT 1,12;"LE
VEL: ";s;AT 1,22;"TIME ";AT 0,0;
: LET bc=USR 32256
1020 LET b=INT (bc/256): LET c=b
c-b*256
1030 LET a$="000000": FOR a=1 TO
 6: LET a$(a)=CHR$ (PEEK (32753+
a)+48): NEXT a
1050 IF (b=88 OR b=89 OR b=87) A
ND (c=128 OR c=129 OR c=130) THE
N PRINT AT 5,b/b; PAPER 1; INK 7
;"GREAT!! NOW TRY THE NEXT LEVEL
": LET s=s+1: LET a$=STR$ (VAL a
$+500): LET b$="0500": LET c$="
EXTRA BONUS ": IF PEEK 32764<6 T
HEN LET a$=STR$ (VAL a$+1000): L
ET b$="1500": LET c$=c$+CHR$ 22+
CHR$ 14+CHR$ 14+"FANTASTIC"
1070 IF c$="" THEN LET l=l-1: LE
T c$=" NO BONUS  "+CHR$ 22+CHR$
 14+CHR$ 12+CHR$ 17+CHR$ 2+" HAR
D LINES ": LET b$="0000"
1080 IF PEEK 32253=175 THEN LET
c$=" OUT OF INK "
1085 IF VAL a$>VAL h$ THEN LET h
$=a$
1090 IF l<s/s THEN PRINT AT 13,1
2; INK 6; PAPER s/s;c$: LET c$="
GAME-OVER": FOR a=9 TO 26 STEP 2
: PRINT AT 10,a; INK 2; PAPER 6;
c$((a-7)/2);" ": FOR b=1 TO 30:
 NEXT b: NEXT a: INPUT "Another
game? (y/n)";c$: IF c$="y" THEN
GO TO 5
1095 IF l<s/s THEN STOP
1100 PRINT AT 10,12; INK 6; PAPE
R 2;"BONUS: ";b$;AT 11,12; INK 7;
 PAPER 3;"SCORE ";a$;AT 13,12; F
LASH 1; PAPER 1;c$
1101 IF LEN a$<>6 THEN LET a$="0
"+a$: GO TO 1101
1102 IF LEN h$<>6 THEN LET h$="0
"+h$: GO TO 1101
1105 FOR a=1 TO 6: POKE 32753+a,
VAL a$(a): NEXT a
1110 LET c$=""
1120 IF VAL b$=0 THEN BEEP a/a,a
-a: BEEP a/a,-12: BEEP a/a,-24
1130 IF VAL b$=500 THEN FOR a=0
TO 10: FOR b=a+5 TO a+5+10: BEEP
 .01,b: NEXT b: NEXT a
1140 IF VAL b$=1500 THEN FOR a=0
 TO 20: FOR b=a+3 TO a+3+6: BEEP
 .02,b: NEXT b: NEXT a: FOR b=66
 TO 0 STEP -1: BEEP ..1,b: NEXT
b
1160 GO TO 1000
2000 IF s>4 THEN LET s=s/s
2001 RESTORE 2000+100*s
2010 READ n$,x,y
2020 IF n$="p" THEN PLOT x,y
2030 IF n$="d" THEN DRAW x,y
2040 IF n$="o" THEN OVER x
2050 IF n$="c" THEN READ r: CIRC
LE x,y,r
2060 IF n$<>"x" THEN GO TO 2010
2065 IF s=2 THEN PRINT AT 10,16;
 OVER 0;" "
2070 OVER 0: RETURN
2100 DATA "p",16,16,"d",223,0,"d
",0,143,"d",-223,0,"d",0,-143,"p
",32,32,"d",191,0,"d",0,111,"d",
-191,0,"d",0,-111,"p",48,48,"d",
159,0,"d",0,79,"d",-159,0,"d",0,
-79
2110 DATA "p",64,64,"d",127,0,"d
",0,47,"d",-127,0,"d",0,-47,"p",
76,76,"d",102,0,"d",0,22,"d",-10
2,0,"d",0,-22,"p",16,159,"d",60,
-60,"p",239,16,"d",-60,60,"o",1,
1,"p",239,100,"d",0,-20,"p",120,
143,"d",15,0,"p",207,95,"d",0,-1
0,"p",120,64,"d",8,0,"p",76,89,"
d",0,-3,"p",195,60,"d",3,-3,"x",
9,9
2200 DATA "p",16,16,"d",239,0,"d
",0,143,"d",-239,0,"d",0,-143,"p
",24,16,"d",231,135,"p",16,24,"d
",231,135
2210 DATA "p",16,151,"d",231,-13
5,"p",24,159,"d",231,-135,"p",12
4,16,"d",0,143,"p",147,16,"d",0,
143
2220 DATA "p",16,80,"d",239,0,"p
",16,95,"d",239,0,"o",1,1,"p",60
,16,"d",10,0,"p",100,60,"d",4,2.
5,"p",78,60,"d",8,5,"p",20,80,"d
",5,0,"p",80,95,"d",3,0
2230 DATA "p",32,142,"d",8,-5,"p
",57,140,"d",8,-5,"p",124,130,"d
",0,5,"p",125,95,"d",22,0
2240 DATA "x",2,2
2300 DATA "p",32,8,"d",223,0,"d"
,0,159,"d",-247,0,"d",0,-159,"d"
,8,0
2310 DATA "p",247,16,"d",-231,0,
"d",0,143,"d",231,0,"p",16,32,"d
",231,0,"p",16,48,"d",231,0,"p",
16,64,"d",231,0,"p",16,80,"d",23
1,0,"p",16,96,"d",231,0,"p",16,1
12,"d",231,0,"p",16,128,"d",231,
0,"p",16,144,"d",231,0
2320 DATA "p",24,152,"d",231,0,"
p",24,40,"d",231,0,"p",24,56,"d"
,231,0,"p",24,72,"d",231,0,"p",2
4,88,"d",231,0,"p",24,104,"d",23
1,0,"p",24,120,"d",231,0,"p",24,
136,"d",231,0,"p",24,24,"d",231,
0
2325 DATA "o",1,1,"p",200,120,"d
",10,0,"p",250,152,"d",5,0,"p",1
90,136,"d",5,0,"p",130,104,"d",3
,0,"p",128,88,"d",3,0
2330 DATA "x",0,0
2400 DATA "c",128,88,80,"c",128,
88,60,"c",128,88,40,"c",128,88,2
0,"c",128,88,7
2410 DATA "o",1,1,"p",125,8,"d",
5,0,"p",126,143,"d",4,0,"p",89,9
0,"d",0,-3
2420 DATA "p",127,108,"d",3,0,"p
",135,88,"d",0,2
2499 DATA "x",2,0
```

Character definer

J Gardiner,
Wymondham,
Norfolk.



THIS PROGRAM IS a comprehensive character definer. It is very user-friendly and allows redefinition of characters on the Amstrad CPC-464 micro.

As well as the standard "pixel-by-pixel"

(continued on page 201)

e a great writer
g yourself to paper.

It takes only two minutes and £59.80 to transform your BBC Micro into the heart of a word processor with VIEW from Acornsoft.

The VIEW word processing system is programmed into a single chip, a 16K plug-in ROM. Once it's installed into your BBC Micro – a simple job for your local dealer – you just switch on and VIEW is operating. (You can switch to other programs, like BASIC, with a single command.)

VIEW is a professional system, yet it's surprisingly straightforward to use.

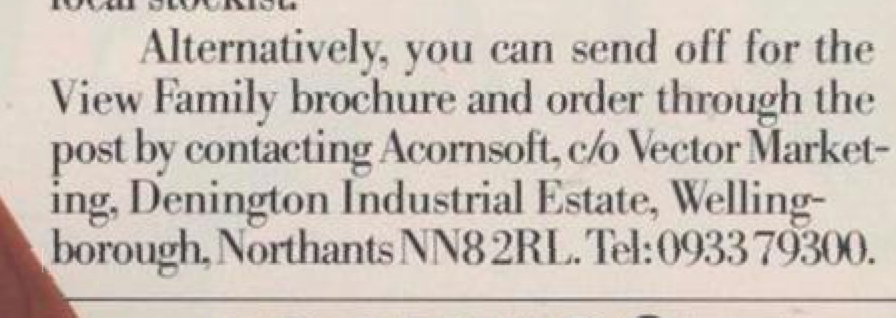
And it's so outstanding it's won the 1984 British Microcomputing Award for Home Software.

All you do is type out your text on the keyboard, and view it on the screen.

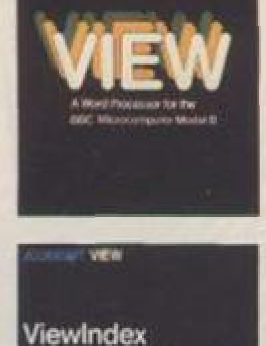
VIEW can search, change and replace particular words whenever they occur in your text. It can swap paragraphs. Automatically alter page numbers. Even count words.

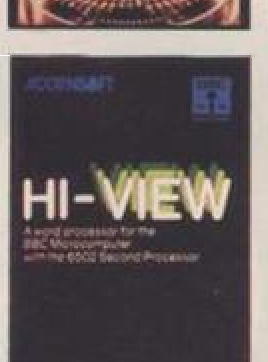
The possibilities are endless, because you can check, edit and change as much or as little as you like until you're satisfied. Then, with a single command, your final version will appear on the screen.

If you want to go even further, the simple addition of ViewIndex, just £14.95, means you can select and index words, complete with page or section numbers.



And of course, when you're ready, any printer that will operate with your BBC Micro will operate with VIEW. But if you want to use the printer's special facilities, such as bold printing or underlining, Acornsoft's Printer Driver Generator (£9.95 on cassette, £11.50 on disc) enables you to do so.







For the more specialised user who wants to take advantage of the extra power offered by the 6502 Second Processor, Hi-VIEW (£59.80) provides 47K of text space in any of the BBC Micro's screen modes.

So whether you're composing a 300 page business document, a letter to the gas board, or a bit of Victorian nonsense, you can polish it to your heart's content, wasting precious little time. And even less paper.

You can get VIEW products from your Acorn dealer. Just phone 01-200 0200 for your local stockist.

Alternatively, you can send off for the View Family brochure and order through the post by contacting Acornsoft, c/o Vector Marketing, Denington Industrial Estate, Wellingborough, Northants NN8 2RL. Tel: 0933 79300.



The text on the screen is in Mode 6.

(continued from page 197)

definition procedure, it also enables the user to:

- Rotate the character to the right by 90 degrees.
- Flip all the character's bits to produce the "inverse" character.
- Produce a mirror image — in the vertical plane — of the current character.
- Save the defined character's data map to tape.
- Read in previously saved data maps.

Definition takes place on an eight-by-eight grid, over which the user moves a cursor using the cursor keys. Pixels of the character can be "toggled" on and off using the Copy key.

Pressing R rotates the character by 90 degrees to the right; F inverts all the bits; M produces a vertical mirror image of the character and D allows the reading in of a saved data map for further adaption. Pressing C when the character is complete produces a print out of the data map in both decimal and hexadecimal. At this point the user is given the option of saving the data map to tape, and then whether he wants to rerun the program.

Conversion of this program to run on other micros may prove to be difficult. This is due to the fact that it uses a pair of windows on the screen and also that it uses a transparent mode of character printing. Windows are a feature found on only a handful of other home micros and the "transparent" printing is — to my own knowledge — unique to the Amstrad.

A stripped-down version of this program can be produced, but it would involve redesigning the screen layout and completely changing the screen-handling routines. Also the Symbol command would have to be replaced with Pokes to define a character.

The program allows you to dump the characters you have just defined to tape as a binary file called Char.

If you want to load these into your games program, or back into the editor for further editing then follow the procedure shown in lines 70 and 75.

SYMBOL AFTER 128
LOAD "CHAR"

Although Himem will normally be the same, problems could be caused by the user attaching add-ons to the machine which will alter Himem.

In this case, if you say add a disc drive to your system and still want to use characters you defined before getting it;

SYMBOL AFTER 128::CLOW = HIMEM + 1
LOAD "CHAR", CLOW

will put the characters into the correct position in memory.

```
10 REM ::::::::::::::::::::::::::::
20 REM :::: CHARACTER DEFINER ::::
30 REM :::::::::::   BY   :::::::::::
40 REM :: J. & A. GARDINER 1984 ::
50 REM ::::::::::::::::::::::::::::
60 REM
70 SYMBOL AFTER 256:CTOP=HIMEM
75 SYMBOL AFTER 128:CLOW=HIMEM+1
80 INK 0,0 : INK 1,24 : INK 2,8 : BORDER 1
90 DIM a(8,8),r(8,8),z(8)
100 MODE 1
110 x=12 : y=4 : f1=0
120 WINDOW #1,1,40,1,15 : WINDOW #2,8,40,16,25
130 WINDOW SWAP 0,1
140 GOSUB 690
150 LOCATE 1,4
160 FOR a=1 TO 8 : PRINT TAB(10);a : NEXT a
170 PRINT TAB(12);"12345678"
180 LOCATE 23,4 : PRINT "Character"
190 PLOT 410,324,2
200 DRAWR 26,0 : DRAWR 0,-26
210 DRAWR -26,0 : DRAWR 0,26
220 PRINT#2,"Use cursor keys to move"
230 PRINT#2,"'F' to flip all the bits"
240 PRINT#2,"'R' to rotate right 90";CHR$(129)
250 PRINT #2,"'M' for vertical mirror image"
260 PRINT#2,"'D' to read in a saved data map"
270 PRINT#2,"'COPY' to reset point"
280 WINDOW SWAP 0,2
290 PEN 3 : PRINT : PRINT TAB(3);"PRESS 'C' WHEN COMPL
ETE" : PEN 1
300 WINDOW SWAP 2,0
310 REM :::::::: MAIN LOOP ::::::::
320 a$=LOWER$(INKEY$)
330 x2=x : y2=y
340 GOSUB 550
350 IF a$="" THEN 320 ELSE a=ASC(a$)
360 IF a=224 THEN GOSUB 480
370 IF a$="f" THEN GOSUB 1150
380 IF a$="r" THEN GOSUB 1210
390 IF a$="m" THEN GOSUB 1520
400 IF a$="d" THEN GOSUB 1360 : GOSUB 690 : GOTO 220
410 y=y+(a=240)-(a=241)
420 x=x+(a=242)-(a=243)
430 IF a>239 AND a<244 THEN GOSUB 620
440 IF a$="c" THEN GOTO 770
450 GOSUB 690
460 GOTO 320
470 REM :::::::: RESET POINT ::::::::
480 x1=x-11 : y1=y-3
490 a(x1,y1)=ABS(a(x1,y1)=0)
500 f1=ABS(a(x1,y1)=1)
510 IF f1=1 THEN ch=143 ELSE ch=32
520 LOCATE x,y
530 PRINT CHR$(ch)
540 RETURN
550 REM :::::::: PRINT CURSOR ::::::::
560 PRINT CHR$(22)+CHR$(1)      'REM  SET TRANSPARENT M
ODE
570 LOCATE x,y
580 PEN 2 : PRINT CHR$(202)
590 PEN 1
600 PRINT CHR$(22)+CHR$(0)      'REM TURN OFF TRANSPARE
NT MODE
610 RETURN
620 IF x<12 THEN x=12 ELSE IF x>19 THEN x=19
630 IF y<4 THEN y=4 ELSE IF y>11 THEN y=11
640 LOCATE x2,y2 : PEN 0
650 PRINT CHR$(32)
660 IF a(x2-11,y2-3)=1 THEN LOCATE x2,y2 : PEN 1 : PRI
NT CHR$(143)
670 RETURN
680 REM :::::::: PLOT DEFINED CHARACTER ::::::::
690 DEF FNbit(b)=a(1,b)*128+a(2,b)*64+a(3,b)*32+a(4,b)
*16+a(5,b)*8+a(6,b)*4+a(7,b)*2+a(8,b)
700 FOR i=1 TO 8
710 z(i)=FNbit(i)
720 NEXT i
730 SYMBOL 255,z(1),z(2),z(3),z(4),z(5),z(6),z(7),z(8)
740 PEN 1 : LOCATE 27,6
750 PRINT CHR$(255)
760 RETURN
770 CLS #2
780 WINDOW SWAP 1,0
790 WINDOW SWAP 0,2
800 PRINT : PRINT
810 PRINT "Character is  '";CHR$(255);"'"
820 PRINT : PRINT"Is this correct ?";
830 x$="" : WHILE x$="" : x$=LOWER$(INKEY$) : WEND
840 IF x$="n" THEN WINDOW SWAP 2,0 : WINDOW SWAP 0,1 :
 CLS #2 : GOTO 220
850 IF x$="y" THEN MODE 1 : GOTO 870
860 GOTO 830
870 PRINT : PRINT"Data map :" : PRINT TAB(6);"dec.","h
ex"
880 PRINT
890 FOR d=1 TO 8 : PRINT TAB(5);z(d),"&";HEX$(z(d)) :
NEXT d
900 PRINT:PRINT"Do you wish to save the data map ? (y/
n)";
910 x$="" : WHILE x$="" : x$=LOWER$(INKEY$) : WEND
920 IF x$="n" THEN 1030
930 IF x$="y" THEN PRINT : INPUT"Please input a file n
ame";file$ ELSE 910
940 PRINT : PRINT"Please insert a cassette"
950 PRINT : PRINT"Press PLAY/RECORD and press any key"
960 x$="" : WHILE x$="" : x$=INKEY$ : WEND
970 file$="!"+file$ : OPENOUT file$
980 FOR x=1 TO 8
990 PRINT #9,z(x)
1000 NEXT x
1010 CLOSEOUT
1020 PRINT : PRINT"::: Data saved as  '";MID$(file$,2);
"' :::"
1030 PRINT:PRINT"Enter number of character to redefine
"
1040 PRINT:PRINT"(ASCII code 128-256)."
1050 PRINT : PRINT "Enter 0 if no definition required.
";: INPUT num
1060 IF ((num<128 OR num>254) AND num<>0) THEN 1030
1070 IF num=0 THEN 1100
1080 SYMBOL num,z(1),z(2),z(3),z(4),z(5),z(6),z(7),z(8
)
1090 PRINT:PRINT"Character";num;"is now  '";CHR$(num);"
'"
1095 GOSUB 3000
1100 PRINT : PRINT"Do you wish to run again ? (y/n)"
1110 x$="" : WHILE x$="" : x$=LOWER$(INKEY$) : WEND
1120 IF x$="y" THEN RUN 80
1130 MODE 1 : END
1140 REM :::::::: FLIP ROUTINE ::::::::
1150 FOR j=1 TO 8
1160 FOR k=1 TO 8
1170 a(j,k)=ABS(NOT(a(j,k)=1))
1180 NEXT k,j
1190 GOSUB 1290
1200 RETURN
1210 REM :::::::: ROTATE ::::::::
1220 FOR p=1 TO 8
1230 FOR q=1 TO 8
1240 r(9-q,p)=a(p,q)
1250 NEXT q,p
1260 FOR p=1 TO 8 : FOR q=1 TO 8
1270 a(p,q)=r(p,q)
1280 NEXT q,p
1290 FOR j=1 TO 8
1300 FOR k=1 TO 8
1310 LOCATE 11+j,3+k
1320 IF a(j,k)=1 THEN PRINT CHR$(143) ELSE PRINT CHR$(
32)
1330 NEXT k,j
1340 RETURN
1350 REM :::::::: READ IN DATA ::::::::
1360 WINDOW SWAP 0,2 : CLS : PRINT : PRINT
1370 OPENIN ""
1380 FOR k=1 TO 8
1390 INPUT #9,z(k)
1400 NEXT k
1410 CLOSEIN
1420 WINDOW SWAP 2,0
1430 FOR i=1 TO 8
1440 sq$=BIN$(z(i),8)
1450 FOR x=1 TO 8
1460 a(x,i)=VAL(MID$(sq$,x,1))
1470 NEXT x,i
1480 GOSUB 1290
1490 CLS #2
1500 RETURN
1510 REM :::::::: MIRROR IMAGE ::::::::
1520 FOR j=1 TO 4
1530 FOR k=1 TO 8
1540 r(j,k)=a(j,k)
1550 NEXT k,j
1560 inc=1
1570 FOR j=5 TO 8
1580 FOR k=1 TO 8
1590 a(j-inc,k)=a(j,k)
1600 a(j,k)=r(j-inc,k)
1610 NEXT k
1620 inc=inc+2
1630 NEXT j
1640 GOSUB 1290
1650 RETURN
3000 PRINT"Do you wish to save the character set ? (y/
n)"
3010 x$="": WHILE x$="" : x$=LOWER$(INKEY$) : WEND
3020 IF x$ <>"y" THEN RETURN
3030 SAVE "CHAR",B,CLOW,CTOP-CLOW
3040 PRINT"Saved as file  'CHAR'"
3050 RETURN
```

Autopause

Ian Cash

ORIC

A USEFUL FEATURE on many games is a pause control, allowing the player to take a breather from zapping all those aliens. However, not all games have this ability, and this is where my program helps.

It was written on a 48K model, but should work with any Oric using the V1.0 operating system and should not be too difficult to convert for other Orics. As the program relies on interrupts it will not work with games which do not use them — but this is a minority I'm sure. The only other drawback is a small delay in keyboard response when typing in direct mode, but as this does not apply to games I'm sure it will not be noticed.

Any key may be used as the pause control — including Ctrl and Shift keys — by simply changing line 60 according to table 1. The game will pause as long as this key is pressed and continue on release.

After typing in the program and checking carefully, Run it, and then Cload the game. The routine can be disabled by

POKE #230, 64

Table 1. For Ctrl,LShift and RShift, the first number on line 60 should be changed to # 09.

The last number should be chosen from the list of keyboard values to replace the 130 for whichever key you wish to use as the pause control.

Naturally this should not be a key already used in the program.

Table 1 continued

```
5 REM Oric Autopause by I.Cash
10 FORA=#231TO#248:READ D:POKEA,D:NEXTA
20 FORA=#27ATO#2B8:READ D:POKEA,D:NEXTA
30 POKE#230,234 'enable:Poke #230,64 to stop.
40 DATA #8E,#42,#02,#BA
50 DATA #EB,#E8,#48,#AD
60 DATA #08,#02,#C9,130 'See text
70 DATA #D0,#5E,#4C,#7A
80 DATA #02,#FF,#FF,#FF
90 DATA #FF,#4C,#46,#02
100 DATA #AD,#43,#02,#F0
110 DATA #35,#8D,#00,#01
120 DATA #8D,#44,#02,#A9
130 DATA #46,#9D,#00,#01
140 DATA #E8,#8D,#00,#01
150 DATA #8D,#45,#02,#A9
160 DATA #02,#9D,#00,#01
170 DATA #A9,#00,#8D,#43
180 DATA #02,#F0,#17,#AD
190 DATA #43,#02,#D0,#12
200 DATA #AD,#44,#02,#9D
210 DATA #00,#01,#E8,#AD
220 DATA #45,#02,#9D,#00
230 DATA #01,#A9,#FF,#8D
240 DATA #43,#02,#AE,#42
250 DATA #02,#68,#40
```

■


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PSION ORGANISER *Competition* RESULTS

THREE PSION ORGANISERS plus a choice of software were up for grabs in our September competition. To enter you needed to place eight of the machine's features in order of importance. As a tiebreaker we wanted you to suggest an original use for the database facility.

As usual our panel of judges made heavy weather of the business of picking the winning list. All agreed that the crucial features of the Organiser were its portability and data storage capacity: on the other features there was fierce disagreement.

"Speedy data access" was a particularly tricky one. It is obviously a vital feature, but can't it be taken for granted? Surely this is what computers are supposed to be good at. And what about "rugged construction"? For most applications the device would not have to be very robust. But perhaps Psion should consider bringing out a range of outdoor models — the Safari Organiser or an underwater version.

The panel's final choice was the following one:

1. Pocket-sized.
2. Permanent data storage.
3. Battery powered.
4. Re-usable datapacks.
5. Speedy data access.
6. Software library.
7. Own program language.
8. Rugged construction.

The three entries which matched or came closest to this list were from: Matthew Langham, Dhauner STR. 184, 6570 Kirn, West Germany; R Shaw, 3, Heathfield Cottage, Lodge Lane, Nailsea, Avon; M Gottlieb, 22 Gibbs Green, Edgware, Middlesex.

M Gottlieb's database suggestion — for storing lecture notes — was a little dull. M Shaw was more original with a plan for keeping records of 100 cows.

We were not sure whether Matthew Langham was joking when he wrote: "I would store some Pretty Special information on Natterjacks in my Organiser". A natterjack, if you are wondering, is a small toad which runs instead of hopping.

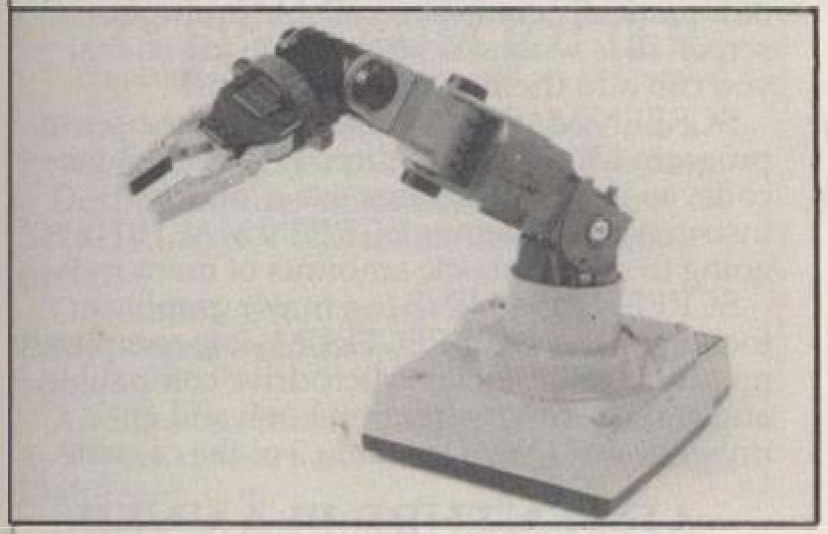
Other database ideas ranged from the humourous to the highly practical. Dutch schoolboy Nouter Falk thought he would use the datapacks to cheat in exams, passing the machine off as a calculator. Good thinking, Nouter, you will be out of there in no time.

But watch out for schoolmaster J Davenport whose idea is to use the Organiser for "filling subjectively observed day to day behaviour characteristics of pupils at the moment of observation".

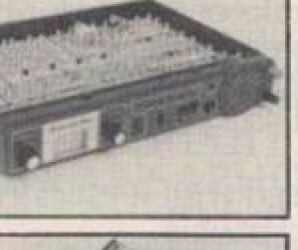
Daniel Langton refused to give anything away. "Private and confidential" he wrote coyly. Come off it Mr Langton, stamp collections are out in the open these days. Unless of course you are thinking along the same lines as D Oliver who suggested "Red-hot phone numbers".

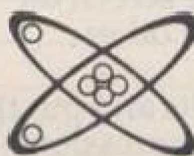
On the practical level, anti-tank helicopter pilot Captain Husband thought to store daily changing battlefield codes and grid references, while fireman D Dempster argued the need for a computerised A to Z index. Even more sensible was P Metherall's idea of entering milk delivery details for his milk round.

Lastly, Russell Cooper seems to be in some confusion with his notion of using the Organiser to compose music.













HERE'S SIX WAYS T

PAINTBOX
Superb Graphics — without expensive hardware!

PAINTBOX is a must for every owner of a 48K Spectrum.

It will give you the ability to produce stunning graphics on your micro — simply.

With PAINTBOX there's no need for expensive hardware — why pay up to £150 for hardware when you can produce incredible picture and graphics with one cassette-based software package?

If you haven't seen PAINTBOX demonstrated you're in for a pleasant surprise!

For instance, PAINTBOX will enable you to draw practically anything on your screen and save it either as SCREEN$ or as a machine code memory file to use in your BASIC or MC programs.

You wield enormous power over the graphics capability of your SPECTRUM — including the definition, storage and use of up to 84 UDG's — 4 times more than normal! A brief description of facilities are as follows:

UDG DRAWING BOARD for defining up to 4 Banks of UDG's including ROTATE, MIRROR, INVERSE etc.

UDG EDITOR for storing up to 84 UDG's for use in screen planning or in your other programs.

PRECISION PLOTTER. A high-resolution drawing board which allows you to draw anything on the screen. Facilities like CIRCLE, FILL, ARC, PLOT, DRAW, ERASE, OVER, DRAW RADIALLY, INK, BRIGHT etc are included and easy to use!

SCREEN PLANNER gives you the best of both worlds! The combined use of PRECISION PLOTTER and your Banks of UDG's for highly detailed and precise screen graphics.

The program is complete with DEMO on side two of the cassette and a 28 page instruction booklet.

PAINTBOX can be used with Joysticks and is Sinclair Microdrive compatible.

SCREEN MACHINE
Instant Machine Code for graphics and text

SCREEN MACHINE is a completely professional graphics utility to use with Paintbox (or any other graphics hardware or software).

It will allow you to manipulate your screen graphics and text in ways which will make your programs better and more memory efficient. For instance:

If you have produced a screen-full of superb graphics you can enlarge, reduce, recolour, flip screen, relocate your graphics to another part of the screen, superimpose one screen on another and perform all sorts of other wonders!

Then you can take your results and put them through a series of memory compression routines to allow you to save enormous amounts of memory. Such items like compressing with or without attributes, saving thirds of the screen and multiple combinations of both are possible.

Never has machine code storage of graphics been simpler because SCREEN MACHINE automatically creates re-callable multiple screen files with a location catalogue so that you can add them to your programs!

SCREEN MACHINE also allows the user to program UDG's or text directly into machine code, so if your programs use a lot of text instructions or menus SCREEN MACHINE is going to save fantastic amounts of memory!

SCREEN MACHINE is a major graphics toolkit for the 48K SPECTRUM. It is completely menu-driven, Sinclair Microdrive compatible, and comes with instruction book and an unbelievable DEMO on side 2 of the cassette.



ADVENTURE PLANNER
A must for the adventure game fan

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It's the best way to beat the 'system' and is obviously for use with any make of computer.

ADVENTURE PLANNER will also assist you in planning Adventure Games for programming — a helpful pad to keep by your computer at all times.

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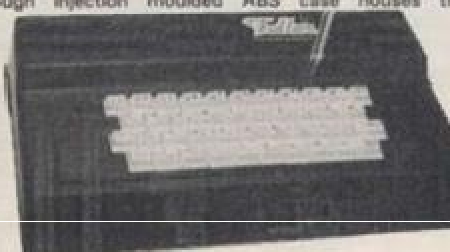


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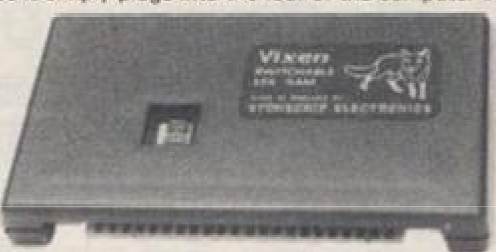
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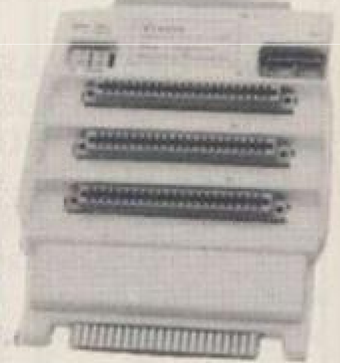


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MICRO MARKETS



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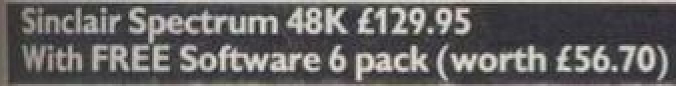
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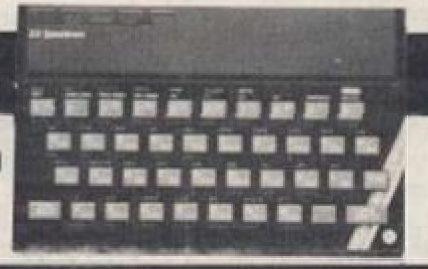


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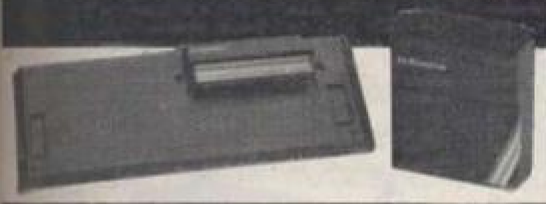


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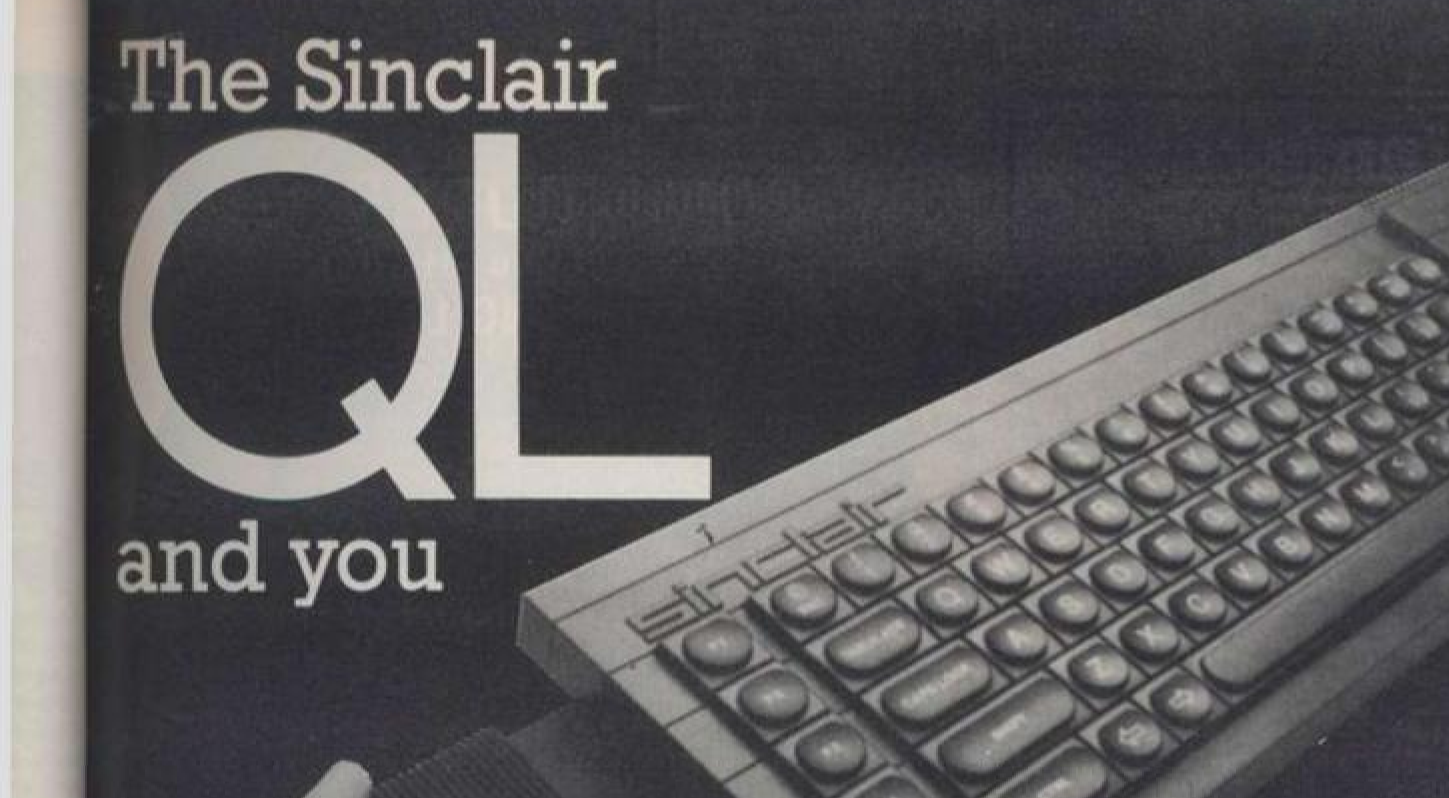




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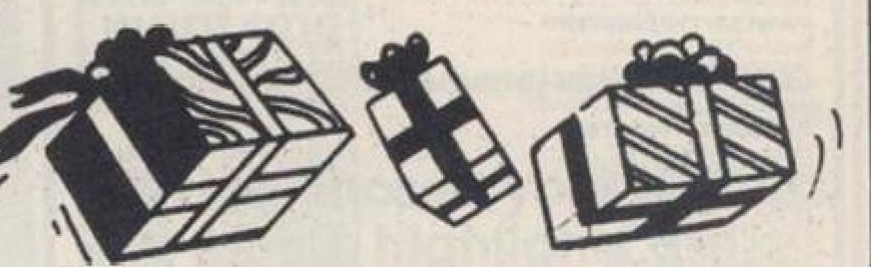
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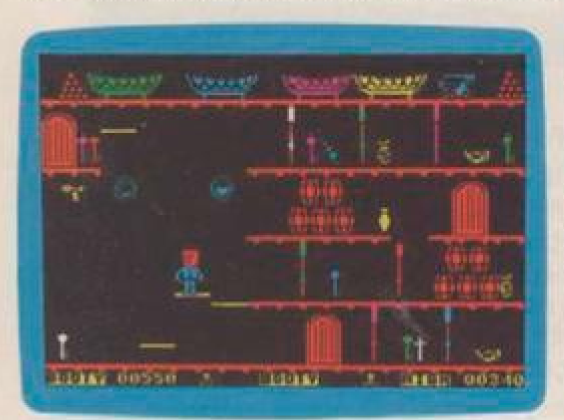
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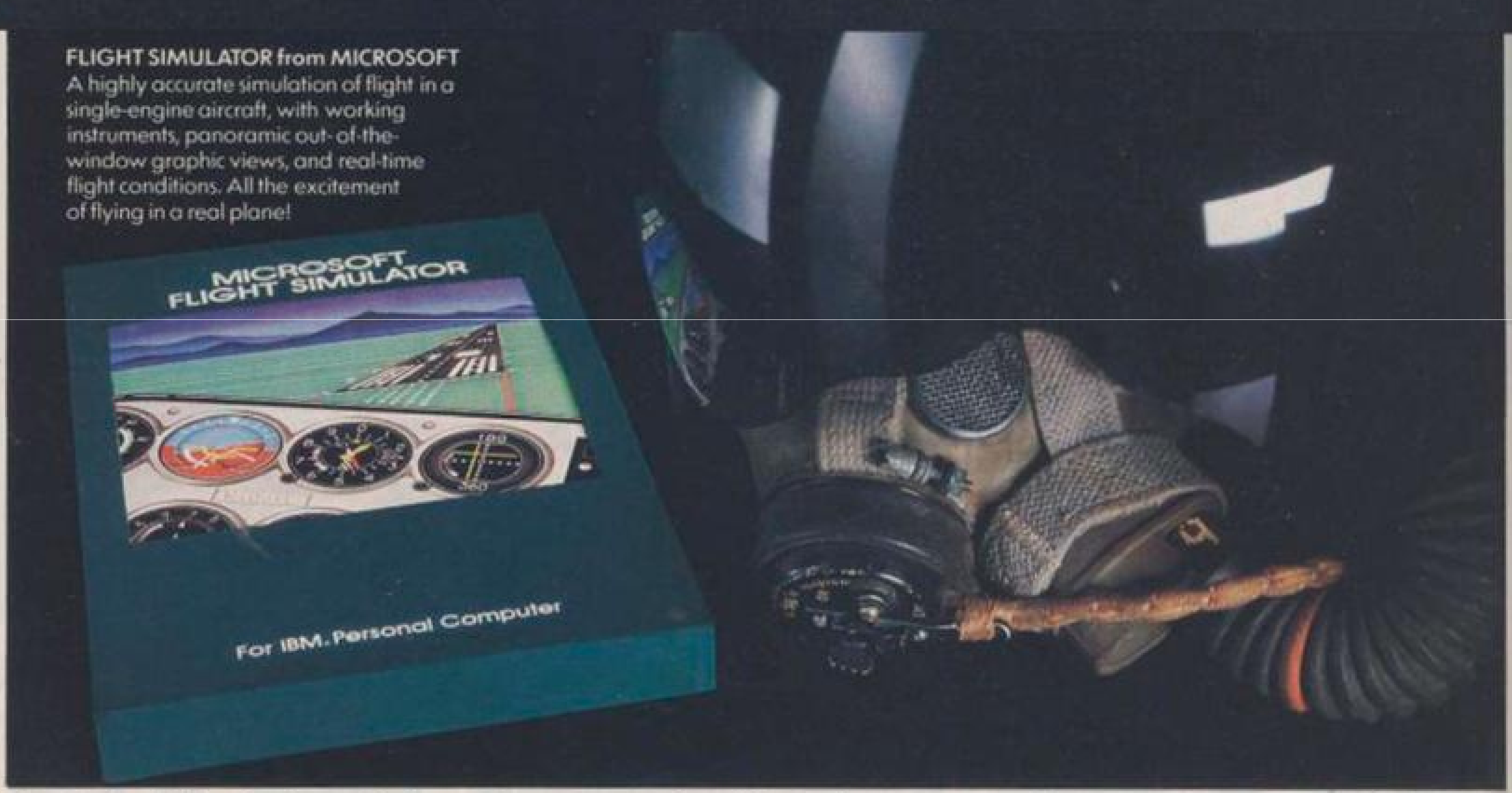
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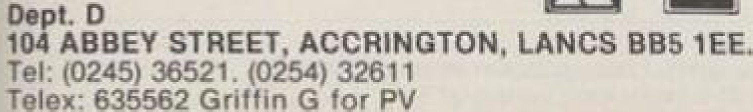
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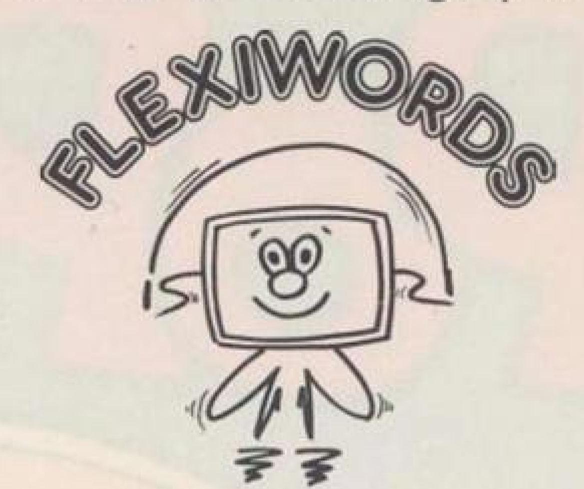
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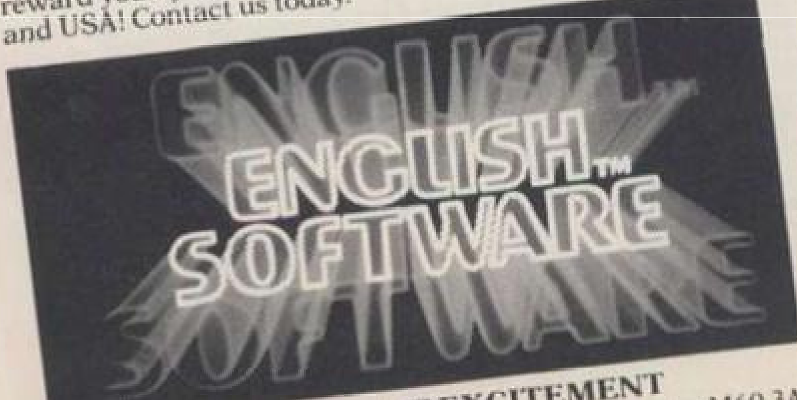
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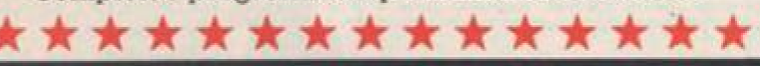
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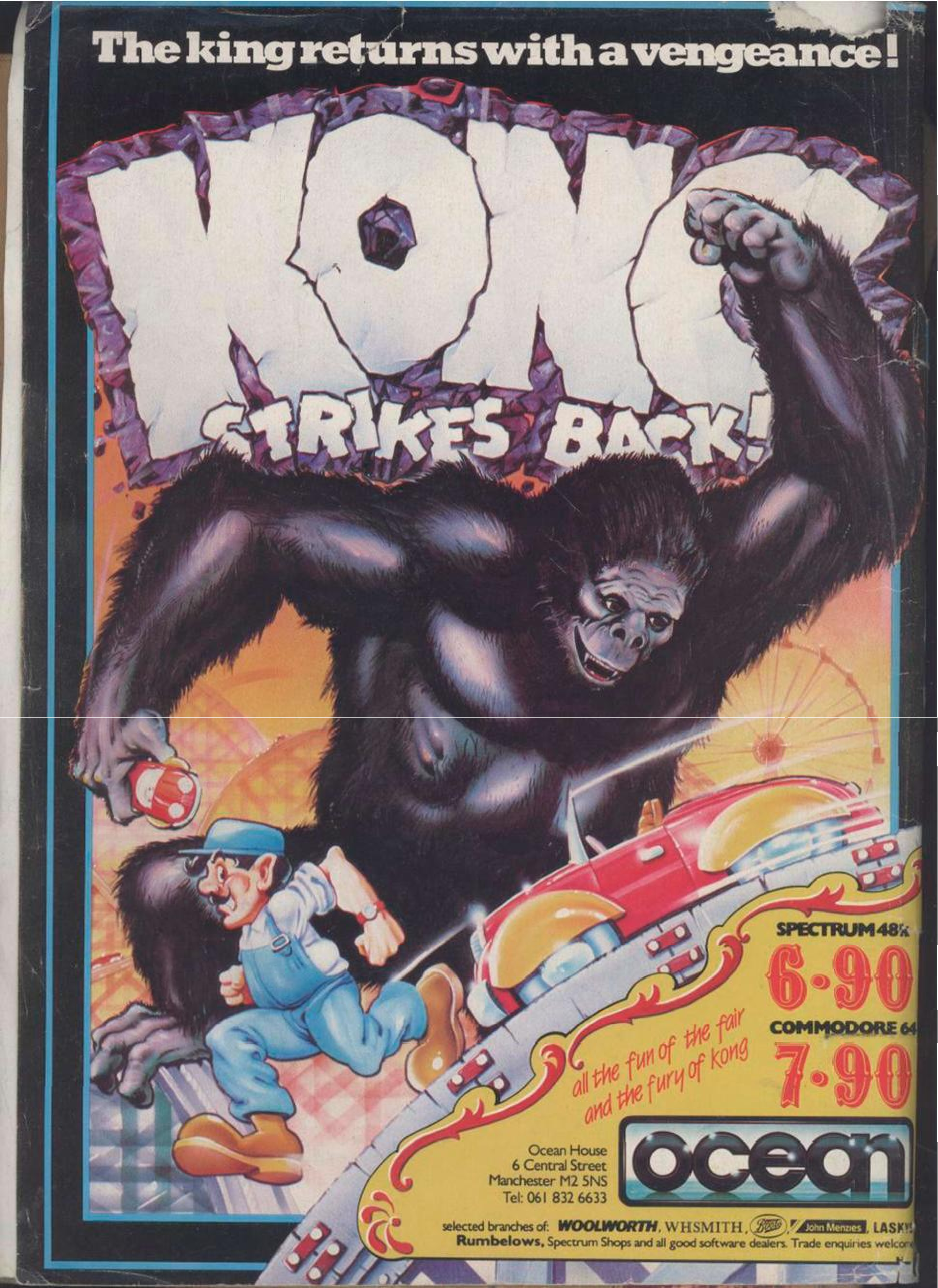
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